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GRANITE BUTTE ELK GIS PROJECT PROGRESS REPORT

May 1991

MAINTENANCE OF ELK HABITAT - RECOVERY OF PUBLIC HUNTING OPPORTUNITY



Granite Butte Project Area - Granite Butte center background, Cellar Gulch and Ogilvie Gulch in foreground.

PROJECT SPONSORS:

Rocky Mountain Elk Foundation (RMEF) - Missoula, MT
Montana Department of Fish, Wildlife & Parks (MDFWP)-Region 8
Bureau of Land Management (BLM) - Butte Area Office
Helena National Forest (HNF) - Helena
Seven-Up Pete Venture - Lincoln

Prepared by: Gayle Joslin, Wildlife Biologist
Montana Department of Fish, Wildlife & Parks



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INTRODUCTION

Land and wildlife management issues are growing increasingly complex, and as resource demands escalate, the need to make expedient, accurate resource decisions grows more acute. A method to store and integrate resource information is necessary if elk populations and habitat needs are to be met and hunter opportunity maintained. Efforts to integrate land use projects, elk seasonal needs, hunter opportunity, and the burdens of private landowners in accomodating these factors, prompted wildlife biologists from the sponsoring agencies to begin consolodating databases into a Geographic Information System (GIS).

Cooperative financial support for this project has been provided by the Rocky Mountain Elk Foundation (RMEF), Seven-Up Pete Venture (a project of Phelps Dodge Corp.), BLM, HNF, and MDFWP. Technical support has also been provided by Lewis and Clark County, Powell County, USDA Soil Conservation Service (SCS), Montana State Natural Resources Information Service (NRIS), and Montana Department of State Lands (MDSL). Recognition is extended to all individuals who have worked on this project (Appendix A).

The Granite Butte Elk GIS Project, originated as a melding and evolution of two separate projects: the Elk Management Unit planning effort of the Montana Department of Fish, Wildlife & Parks (MDFWP), and an energy exploration impact analysis upon elk in the Sieben Ranch-Sleeping Giant area. The latter project was carried out with support through the Bureau of Land Management from the Unocal Corporation, a subsidiary of Union Oil Inc. These projects expanded into a Challenge Cost Share cooperative elk/land use study between MDFWP, BLM and the Helena National Forest (HNF) in 1989, and further evolved into the Granite Butte Elk GIS Project in 1990.

The Granite Butte Elk Project is a cooperative effort to develop and maintain a comprehensive, multi-owner data base to facilitate environmental analysis of proposed actions. Public interest in elk, and the fact that elk quickly respond to changes in environmental conditions, provide the rationale and focus for this project.

The GOAL of this project, as defined in the project Charter (Appx 2), is to ensure that elk and elk habitat will continue to be an important aspect of Montana's heritage, to be enjoyed by the people of Montana and visitors to the state. Toward that goal, this pilot project is designed to:

- Maintain or improve elk populations and habitat, elk hunting opportunity and elk-related experiences within the Granite Butte Unit by developing close coordination between participants

- Develop means to identify cumulative impacts of proposed actions upon elk, their habitat, and recreation opportunity, and recommend cooperative actions to be implemented by land and wildlife management agencies
- Test the feasibility and applicability of this approach to other areas.

OBJECTIVES of this project are to:

- Develop a coordinated approach to management of elk and elk habitat on public lands
- Devise management strategies to minimize displacement of elk from public to private lands and consequently reduce private landowner concerns
- Enhance public opportunities to hunt, view and otherwise enjoy elk on public lands and maintain or improve public hunting opportunity on private lands
- Facilitate the exchange of information between land managers needed for cumulative effects analyses
- Develop a Geographic Information System (GIS) data base planning tool to help accomplish these objectives
- Promote public understanding and appreciation of elk habitat needs using GIS generated graphic displays of elk habitat and land uses in the Granite Butte Unit

The GIS technology will contribute to project goals and objectives by visually displaying the seasonal distribution, habitat and security needs of elk, and the impacts of habitat modifications from competing land uses. Additionally, this project will identify cumulative impacts to elk habitat and hunting opportunity. This will provide a framework to recommend preventive and/or remedial actions to management agencies. The most recent information available for the area can be displayed using GIS technology. It will be a valuable device in fostering resolution of complex interagency issues.

This cooperative approach will illustrate the impact on elk habitat from competing uses, and will propose options to balance elk habitat necessities while accommodating other uses. This technology will illustrate the demands being made upon the land, and will help identify problems that management prescriptions must resolve.

GRANITE BUTTE GIS ELK PROJECT AREA & ELK MANAGEMENT UNIT HUNTING DISTRICTS 293, 439, & 443

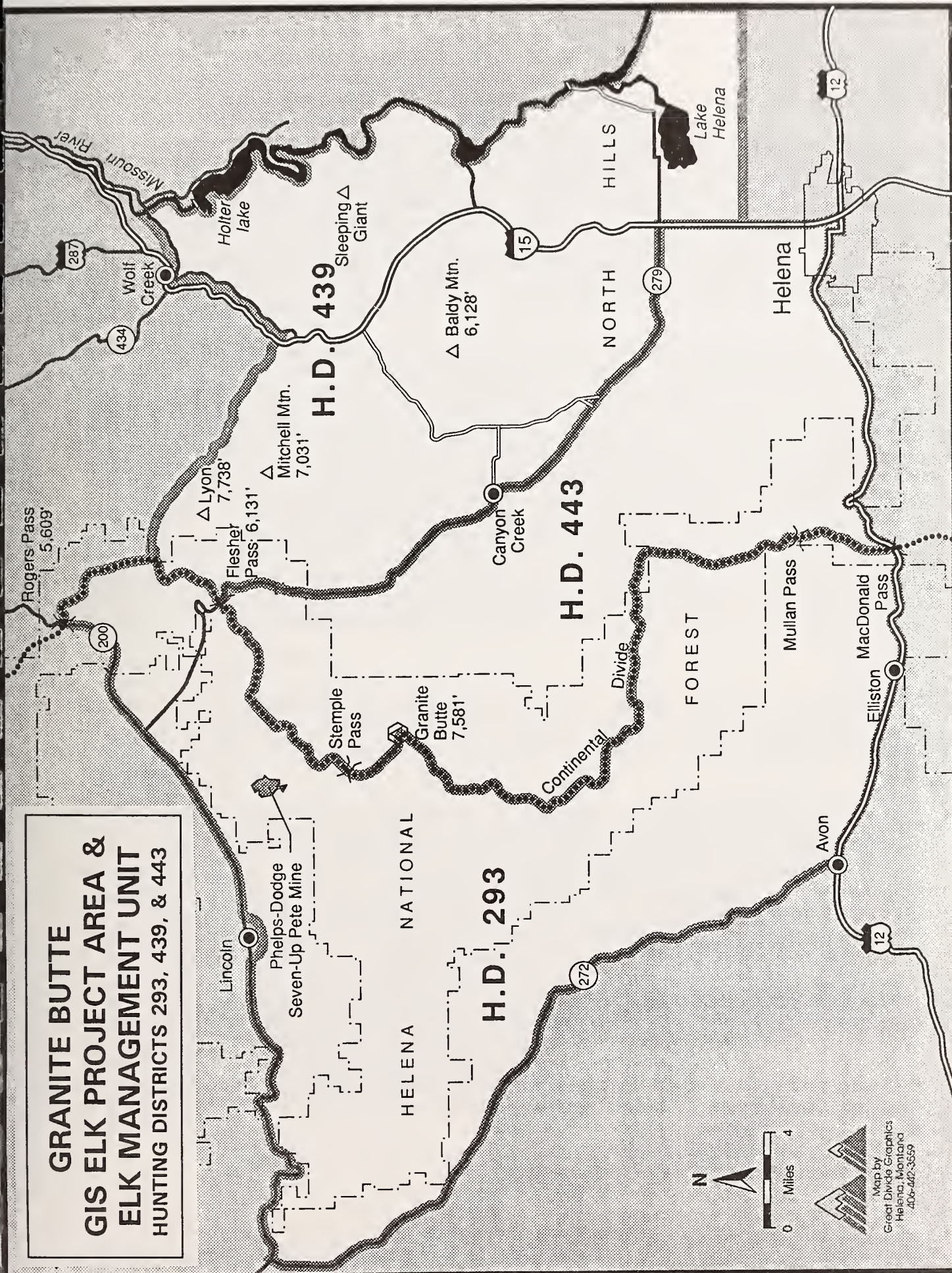


Figure 1

AREA DESCRIPTION

The Granite Butte project area (Fig. 1) encompasses approximately 1,200 square miles of public and private lands, ranging from 3600 feet to 8300 feet in elevation. The public lands are managed by the United States Forest Service, the Bureau of Land Management, and the Montana Department of State Lands. These lands, in addition to sustaining an exceptional wildlife resource, also support timber harvest, mineral development, livestock grazing, subdivision and rural homesite development, agriculture, and recreational activities.

The Granite Butte project area is actually the Granite Butte Elk Management Unit (EMU) which is composed of four hunting districts including 284 (a very small district surrounding Lincoln), 293, 439, and 443. The Granite Butte EMU is one of 35 elk management units in Montana managed by the MDFWP (Fig. 1). The area extends from the Missouri River on the east to Mineral Hill at the junction of Highways 200 and 141 on the west, and from Avon to East Helena along U.S. Highway 12 on the south, to Lincoln and Holter Dam on the north. The Continental Divide bisects the unit and includes MacDonald, Priest, Stemple, and Flesher Passes. About 40 percent of the EMU is Helena National Forest land, about 8 percent is BLM, 4 percent is DSL, and 58 percent is private. About 12 percent of the area, all private lands in the Helena Valley, does not actually provide available elk habitat.

RESOURCE CONDITIONS

Current and proposed activities in the Granite Butte area are briefly described. Past activities have not been compiled or mapped at this time, but will be reported upon in the 1992 annual report.

Elk: Information on movements, distribution, and habitat use in the Granite Butte project area is needed to properly manage elk. The area contains important wildlife habitat on both public and private lands. Land use activities on public lands can reduce wildlife security and cause displacement that may lead to problems on adjacent private lands. Increased use by elk on private lands can increase burdens on private landowners through game damage or high levels of public hunting pressure. This usually results in reduced recreational opportunity. From 1985-1989, in the Granite Butte EMU, an average of about 300 antlered and 160 antlerless elk have been harvested by 4,000 hunters over 21,000 hunter days annually. Current concern revolves around the age structure of bulls being harvested. The composition has declined to only 1% of the bull harvest being composed of brow-tine bulls (BTB) that have antlers of 6 or more points. Eighty-two percent of harvested bulls are yearlings.

Timber Harvest: Available timber harvest information (Appx 3) indicates that a minimum of 20 million board feet (mmbf) of timber have been or will be cut from the Granite Butte area between 1985 and 1994. Roughly 9 sale areas involving approximately 9.7 mmbf of timber from 1,800 acres are planned for sale during 1991 by the Helena National Forest. The DSL has or plans to cut 4.07 mmbf of timber on approximately 1,305 acres, largely in the Lyons Creek and Sears Gulch area from 1987 to 1993; several small sales have been harvested on BLM lands (Cellar Gulch, Lost Horse Creek), and from 2 to 10 mmbf is tentatively planned for sale in the Marysville Compartment Plan. Private landowners planning on harvesting timber must apply with DSL for a Hazard Reduction Agreement (HRA) which is essentially a permit allowing volumes to be sold to Montana mills. DSL records indicate that between 11/85 and 5/93, 105 sales involving an estimated 150,487 board feet of private sawlogs has been or will be harvested. Private land post and pole, pulpwood, house logs, and power pole sales involved 47 sales. Corporate timber harvest volumes have not yet been compiled. East of the Continental Divide where security, not forage, is a limiting factor for elk, timber harvest continues to alter elk habitat distribution within the landscape (Fig. 2).



Figure 2. Nevada Mountain ridge, North Fork Little Prickly Pear Creek clearcut, valley bottom agriculture.



Figure 3. Sears Creek cutting units with log haul road accessing drainage head, Granite Butte in background.

Roads: The project area ranges in road density from 0 roads per square mile in the Nevada Mountain Roadless Area to in excess of 6 miles per square mile of road in the Dog Creek, Little Prickly Pear and Seven Mile Creek areas. Both private and public lands have been heavily roaded in some areas (Fig. 3).

Livestock Grazing: Public land grazing allotments exist on the HNF (10 allotments on HRD, 15 allotments on LRD), BLM (30 allotments), and DSL (74 allotments). Allotment management plans are being or will be developed for all FS and BLM allotments over the next 5 years. Allotment location, period of use, AUMs, agency authority, and final allotment plan date will be compiled in the 1992 annual report. Public land livestock grazing information has not yet been incorporated into the Granite Butte data base, but tabular data will be compiled in FY92 and a spatial theme depicting allotment areas will be mapped prior to completion of this project.

Mineral Development: Numerous hard rock mines are proposed and active exploration is occurring in several areas of the Granite Butte project. The Esmeralda Hill area is of interest to at least 2 prospecting companies, and the Seven-Up Pete area is the largest and most active prospect being pursued by Phelps Dodge and Canyon Resources. The Mike Horse mine is a large inactive, abandoned mine in the headwaters of the Blackfoot River, and hundreds of smaller abandoned mines exist throughout the area. The Marysville and Elliston/Avon areas are honeycombed with mine adits, shafts, and exploratory pits. Mapping of past and present mining activities within the Granite Butte project area will be accomplished before the end of the project.

The Granite Butte area adjoins the Rocky Mountain Front to the north. Due to its proximity to geologic structures which entice energy companies to probe for oil and/or gas, the Granite Butte area has been the recent focus of exploratory drilling near the divide on Lyons Mountain (Fig. 4). The Lincoln Ranger District plans to initiate an EIS in 1992 to address energy exploration in the the northern portion of the Granite Butte area.



Figure 4. Unocal exploratory well on Lyons Mountain, October 1989.

Military Training Exercises: The Army National Guard conducted two military training exercises within the Granite Butte area during 1991. A pyrotechnics exercise occurred during June 11-15 in the Greenhorn Mountain area. The second was an orienteering exercise during July 20-25. Military activity in sensitive areas during the height of the calving season is likely to be a conflict.

Rural Development: Subdivisions and occasional-sale home-sites and seasonal developments are concentrated in the Helena Valley. They extend onto the eastern flanks of the Continental Divide in the Ten Mile Creek, Seven Mile Creek, Three Mile Creek and Canyon Creek drainages. West of the Continental Divide, rural development is concentrated in the vicinity of Lincoln. The small communities of Elliston and Avon are relatively contained. Farm and ranch operations occupy the remainder of the foothills habitat on both sides of the divide.

PROJECT DEVELOPMENT

Information acquired through this project will allow more comprehensive consideration of elk habitat by public land managers in carrying out land use activities, including timber management, road management, and grazing. Collection of data for elk herds has only recently been initiated, consequently information upon which to make management decisions is not at a level comparable to many other elk herds. State management goals for this elk herd emphasize cooperation of private and public land managers in the management of elk habitat (draft Granite Butte EMU Plan, Appendix 4).

Elk movements and habitat use in relation to current land use activities are being evaluated. Areas of seasonal importance to elk are being identified, allowing a more proactive approach to resource management. Land use allocations can be adjusted as appropriate. Potential habitat improvement projects can be identified and prioritized. Through use of an automated mapping system, the project will visually detail the actual and possible consequences of elk redistribution and help identify habitat management alternatives and improvement projects.

CHARTER

A draft charter was developed to describe the mission of the Granite Butte Elk GIS Project, define its organizational structure and responsibilities, detail goals and objectives, and define the charter's principles (Appendix 2). The final charter will be completed during summer 1991, and will be distributed for agency endorsement.

A seven member Steering Committee, composed of representatives from each funding and participating agency/organization, was consolidated in June 1991. One technical committee, involving four subcommittees covering elk, vegetation, land use, and data management, has been functioning since the inception of the project in 1990.

SCHEDULE OF TASKS

The following schedule of project tasks are based on the state's fiscal year (July 1 - June 30). This schedule was outlined in the initial funding proposal. Items marked with a hat (^) were not accomplished, while items marked with an asterik (*) have been completed:

Elk marking - HD 439 and 443.....	Jan - Mar 1990*
Elk marking - HD 443 and 293.....	Jan - Mar 1991^
Elk monitoring.....	1989*,90*,91*,92,93
Mapping of land use activities.....	1990*,91*,92,93
Mapping of elk distribution.....	1990*,91*,92,93
Progress Reports Annually.....	Jan^(Jun)91*,92,93
Final Report	Oct 1994

* accomplished ^ not accomplished

Modifications and additions to this schedule have been made because of funding limitations or seasonal workload constraints. For example, elk marking was not accomplished during 1991 due to funding limitations, but unless the same constraints develop, marking will be done in 1992. Annual progress reports were initially scheduled for January, but since this task was completed by MDFWP during 1991, this report was completed during summer to allow for winter workload demands.

SUPPORTING INFORMATION

Portions of the Granite Butte area have been included in several previous studies, projects, and analysis areas therefore a body of resource information currently exists for the area. The following is a list of documents that include information about portions of the area, and will be used to quantify the nature of the area during the course of the project: Sleeping Giant and Sheep Creek Wilderness Study/Environmental Impact Statement (1991), Granite Butte Elk Management Unit Plan (1991), Elk Survey and Inventory Progress Report (1989), Lake Helena Wildlife Management Area Plan (1991), Headwaters Resource Area - Resource Management Plan/Environmental Impact Statement (1983), Environmental Assessment - Sleeping Giant Land Exchange (1979), Helena National Forest Plan (1986), Union Oil/Sieben Ranch Elk Project - Progress Report (1989).

METHODS

GIS DEVELOPMENT

Systems: Land use trends as they relate to elk habitat will be assessed through a Geographic Information System mapping program. Land use activities, habitat information, and seasonal elk distribution is being compiled. BLM mapping facilities at the Billings State Office is being employed to store thematic data. A PRIME computer along with three software programs is being utilized on the project. ADS software (Automated Digitizing System) is the capture system used to collect project data. MOSS (Map Overlay Statistical System) is the analytical software package being used for data manipulation. Final output maps are generated using COS (Cartographic Output System). Data digitizing and quality control is being conducted at the BLM State Office in Billings and the Garnett Resource Area in Missoula.

Base Themes: The Granite Butte Project area encompasses 34 7½ minute topographic maps. Seven base data themes are being compiled and digitized (at a scale of 1:24,000) from these maps: 1 - land lines (section lines and UTM lines), 2 - political boundaries (county lines, jurisdictional boundaries), 3 - streams, 4 - lakes, 5 - transportation (highways and major county roads), 6 - land ownership, 7 - elevation contours (USGS topographic database entitled Digital Elevation Model (DEM)).

Resource and Use Themes: In addition to base themes, five resource data themes are being compiled with associated tabular information stored in ORACLE or dBase III Plus software. Resource data themes currently being compiled include: elk locations, soil types, vegetation data, watersheds, roads. Data compilation from various sources is being coordinated at the Technical Committee level. In order to standardize data sets from various agencies and provide continuity in data input, coding cross-walks are being developed between agency data sets. For each theme, a data dictionary is being compiled to document theme development, define codes, and describe user processes.

The vegetation data base is being constructed from data that currently exists on maps and/or aerial photographs. On-site data collection is not planned at this time, however the Region One Forest Service Ecodata study group may be working within the Granite Butte project area to ground truth remotely sensed infrared spectral imagery. Timber stand tabular data contains: acreage of the stand, percent slope, elevation, soils information, stand structure data, habitat type, PI type.



Figure 5. West North Hills open grassland habitat type (low elk security) and Little Prickly Pear Creek valley bottom with intensive agriculture.

The road data base has been the focus of the Land Use Subcommittee during the first year of this project. The term "roads" when used to define the "road data base" is used to depict routes other than highways and major county roads that occur on the transportation base theme. The term "roads" encompasses maintained and unmaintained roads, on both private and public lands. In addition to these criteria, attribute information includes: land ownership, jurisdiction, closure types (if any), dates of closures, and type of vehicles allowed. Primary emphasis has been on compiling road information, standardizing attribute code systems, and mapping roads onto mylar overlays for digitizing. Appendix 5 outlines the Road Mapping Criteria, and will eventually be formatted as a Data Dictionary for roads.

The Land Use Subcommittee will continue to focus attention on roads since roads promises to be the biggest task, but mapping trails, railroads, mining activities, timber harvest, campgrounds and communities will also be future efforts.



Figure 6. Elk security is provided by dense vegetation, topographic relief and low road densities along the Divide.

Figure 5 depicts agricultural development of valley bottoms and the low elk security grasslands of the North Hills. Figure 6 contrasts public land habitats that are capable of providing elk security if road densities are minimal and vegetation cover is adequate.

ELK INVENTORY

Elk Marking: Elk capture has involved the use of a Bell 47 helicopter, a pilot, and veterinarian/shooter. Later when a Hughes 500-D helicopter was employed, the wildlife biologist also was present as "time keeper", recording response of the darted elk to the drug, to help track of the darted animal, and to keep a running account of events.

The process of immobilizing an elk involved careful positioning of the helicopter in relation to the terrain and the movement tendencies of the given elk herd. Once positioned, the pilot would

quickly take the helicopter down to within 10-30 feet of a selected animal, approaching from behind. The shooter, using a double barrel 28 gauge shot gun, would lean out the passenger door and fire a rump or flank shot at the animal that the pilot had singled out. A colored cotton tail puff on the end of the dart made the darted elk distinguishable from other elk in the herd. Once shooting was completed, the helicopter would gain elevation, move away from the herd, hover while observing the darted animal, and passengers would watch to detect signs of the drug taking effect. Once the animal laid down, the helicopter was landed near by, or in the case of steep or heavily timbered terrain, passengers eased out of the helicopter once it had been "toed-in" to an opening on a slope.

Adult elk were immobilized with 8 milligrams (mg) of Carfentanil while yearlings received dosages of 6 mg. One cc of Dermosedan, a tranquilizer, was administered to each animal. Individuals were pregnancy tested, eartagged, radio-collared, and aged according to tooth wear. A diastema measurement (distance between the fourth incisor and first premolar) was also obtained as an indicator of condition and age. A blood sample was taken for serological testing for brucellosis, bluetongue, anaplasmosis, infectious bovine rhinotracheitis, bovine virus diarrhea, para influenza-3, and leptospirosis. Once data collection was completed, 10 cc of Benamine, an analgesic and anti-inflammatory agent; 15 cc of Floccillin, a long-acting antibiotic; and 10 cc of E-Se, a vitamin E and selenium compound to counteract the stress of capture, was administered. Two hundred mg of Naloxone, the Carfentanil antagonist, was intravenously injected and the animal responded within 30 seconds by getting up and trotting away.

Telonics configuration MOD-500 radio transmitters, packaged in hermetically sealed canisters, emitting a specified frequency in the range of 150.000 to 151.999 MHz, were either factory fitted to conveyor belting material or contained in molded PVC pipe that functioned as the collar. Each collar was individualized with unique symbols and color combinations, so each animal could be specifically recognized in the field.

Elk Monitoring: Elk relocation flights were made at approximately 3 week intervals in a Cessna 180. A Telonics Telemetry TR-2 receiver-scanner was used in conjunction with a rotating, three-element Yagi antenna mounted through the belly of the aircraft to locate collared elk. Ground tracking was conducted only when an animal was suspected of being dead. The receiver and a collapsable hand-held two element Yagi antenna was used during ground tracking.

During each radio relocation, and for all elk observed incidental to relocation sites, the following information is gathered: classification of observed animals = cow, calf, spike bull, branched yearling, brow-tine bull less than 6 points, ≥ 6 point bull, unclassified. Site specific information is also gathered

including time-of-day, drainage name, location to nearest $\frac{1}{4}$ section, vegetative cover type and tree species (if possible), aspect, and elevation.

Annual classification surveys of each hunting district were conducted between January and May in either a Bell 47 Sely helicopter or Hughes 500-D helicopter for hunting districts (HDs) 439 and 443, and in a Piper Super Cub in HDs 293 and 284. HDs 439 and 443 are generally surveyed during winter months while HDs 293 and 284 are spring "green-grass" surveys. The nature of the winter ranges dictates the type of survey. During annual classification surveys, locations of observed elk and elk tracks are noted and animals are classified. Habitat information similar to that collected during radio flights is also recorded.

Elk Data Analysis: All elk data is recorded on dBase III Plus software and the following information is entered: identification number, date, time, map number, drainage name, drainage code, initials of observer and pilot, $\frac{1}{4}$ section, Universal Transverse Mercator (UTM) zone, UTM longitude, UTM latitude, total elk observed, number of cows, calves, spikes, branched yearlings, brow-tine bulls less than 6 points, bull equal to or greater than 6 points, unclassified; whether the radio-marked animals was observed or not; code number for herd unit or analysis area; vegetative cover type and tree species; aspect, elevation, and whether the observation was made by state or federal agency personnel or private citizen.

Elk home range analysis and Granite Butte GIS elk analysis and mapping is conducted with TELDAY software that was developed at the Bozeman Research Lab of MDFWP (Lonner and Burkhalter 1984). The following data fields (Appendix 6) exist on that program: identification number, date, time, UTM zone, UTM longitude, UTM latitude, elevation, whether the animal was observed, code for herd unit or analysis area, drainage code, vegetative cover type and tree species. The latter two fields are supplemental to the base Telday software.

Using Telday analysis, the size and geographic activity center (GAC) of individual and collective home ranges can be identified. Analysis for both yearlong and seasonal home ranges is possible. Fidelity indices, or the extent to which a specific animal or herd unit annually returns to a given seasonal use area can be determined and may provide a measure of displacement in relation to habitat disturbance (Skubinna and VanDyke 1991). The extent to which elk use different elevations on a seasonal basis can also be displayed.

Seasonal periods of elk use are defined as winter - December 1 through March 31, spring - April 1 through May 15, calving - May 16 through June 15, summer - June 16 through September 30, fall - October 1 through November 30.

Elk - Public Involvement: The Granite Butte Elk Management Plan defines the goals for population levels, composition, and hunter recreation opportunity as well as habitat objectives within this EMU. Habitat and population management strategies are described, and options are discussed (Appendix 4). These goals are being developed with public involvement through the news media, public meetings and personal contacts.

Hunter check stations, in addition to functioning as a method to collect biological information from harvested animals during the hunting season, also provide sports-people the opportunity to tell the department what they are feeling about wildlife populations, hunting opportunity, landowner issues, road management systems, and ethics of hunters. Check stations are set up on opening day of the general hunting season in the Helena Valley at the base of the North Hills, at Silver City, and a third station will be set up beginning in 1991 at the Sieben Interchange. A hunter questionnaire was given to all hunters coming through Granite Butte check stations, who were successful in harvesting an elk in the Granite Butte EMU. In addition, the questionnaire was mailed to 415 Granite Butte antlerless permit or A-7 license holders.

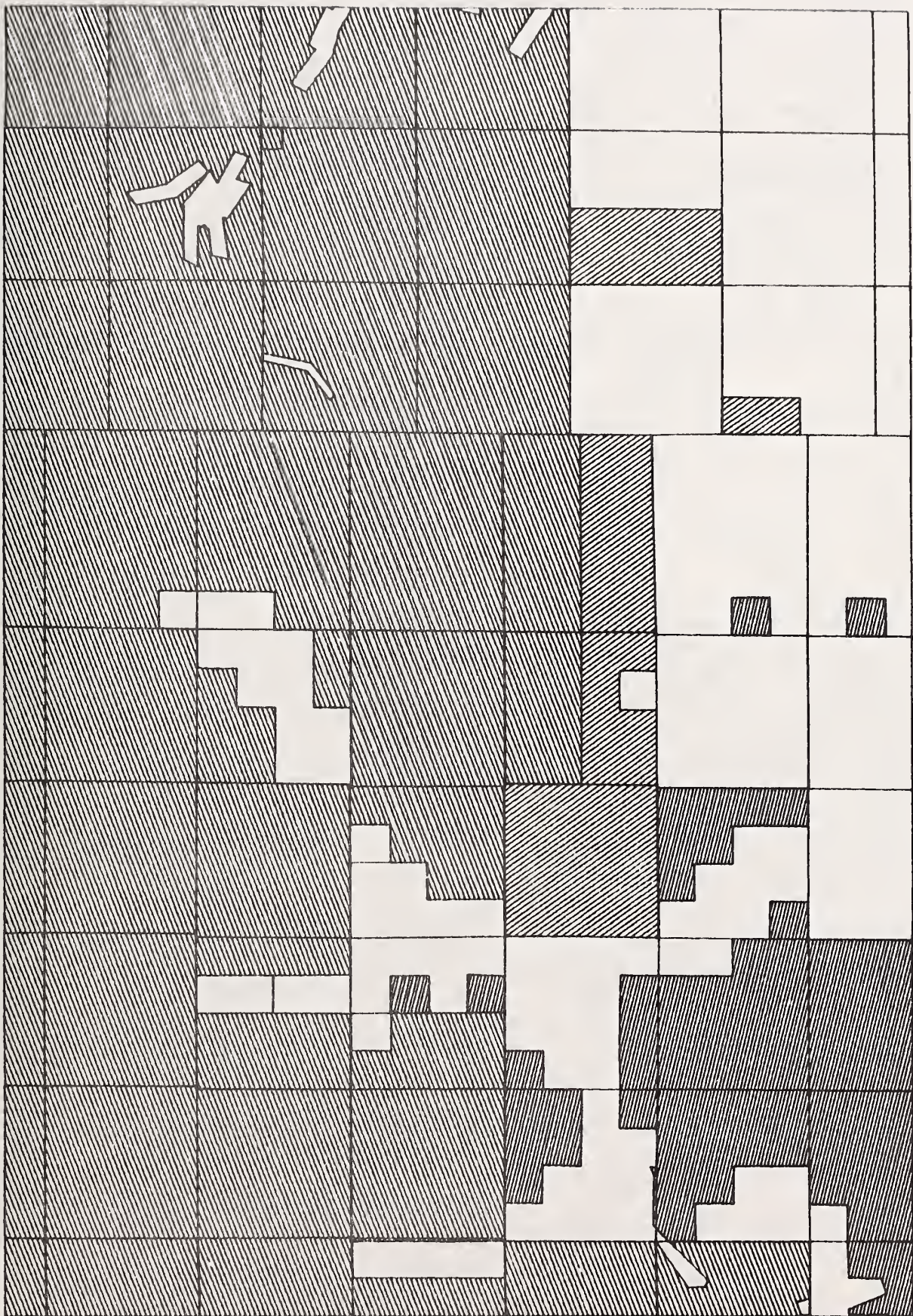
The questionnaire queried hunters about the type of animal killed and location of kill, but it also inquired about their perceptions of the Granite Butte hunting opportunity, elk populations and composition, method of hunting and transportation, and reasons for selecting this area in which to hunt (Appendix 7).

RESULTS

GIS DEVELOPMENT

Base Themes: The seven base data themes are in various stages of completion for each of the 34 topographic maps comprising the Granite Butte Project Area. Appendix 8 indicates the status of base theme compilation per individual quad map. To date, land lines and boundaries have been digitized and quality assured for all 34 quad maps. The transportation and lake themes have been completed for 12 maps. Streams have been completed for 7 maps, and ownership has been completed for 2 maps. Figures 7, 8, and 9 illustrate examples of GIS generated base theme information for one of the 34 topographic map.

Resource and Use Themes: Elk locations will be updated annually, but approximately 1800 elk location entries, representing thousands of elk, currently exist within the system. Mapped soils data for private lands is currently being compiled and mapped onto mylar from information at the U.S. Soil Conservation Service (ten maps completed). Soils data for the USFS is complete and currently stored in Oracle. The BLM soil data is mapped and ready for digitizing.



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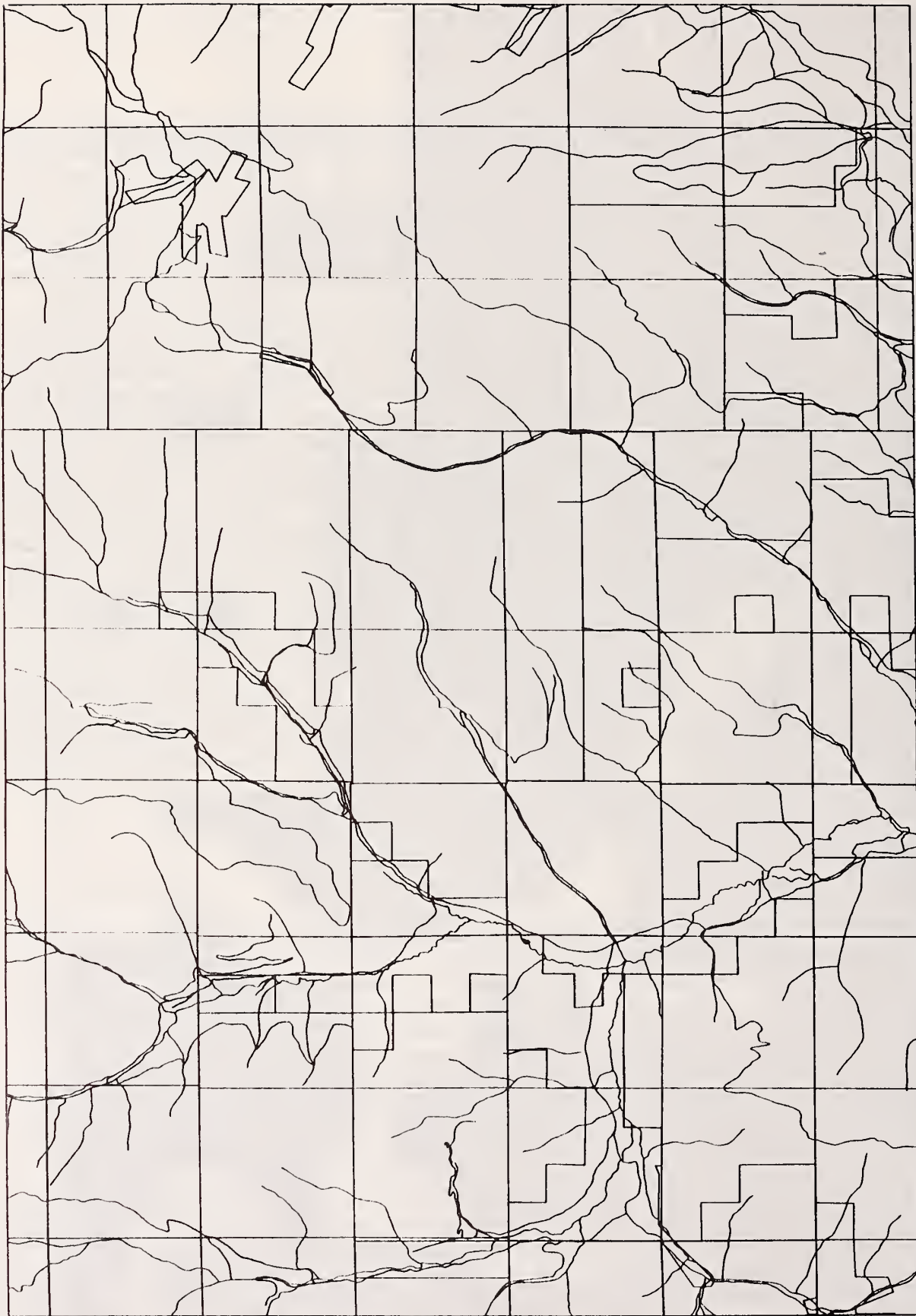
Figure 7

UTMLAND ALL
 UTMERSON SUBJECTS S*
 UTMERSON SUBJECTS P*
 UTMERSON SUBJECTS **PD**
 UTMERSON SUBJECTS **FS**

STATE LANDS
 PRIVATE LANDS
 PUBLIC DOMAIN LANDS
 FOREST SERVICE LANDS



GRANITE BUTTE LAND STATUS



SCALE 1" = 48000

Figure 8

UTMLAND ALL
 UTM LAKES ALL
 UTM STRMS ALL
 UTM BOUND ALL
 UTM BLOWN ALL
 UTM TRANS ALL

LAKES
 STREAMS



ROADS

GRANITE BUTTE BASE THEMES



SCALE 1: 48000

Figure 9

GRANITE BUTTE VEGETATION TYPES

Infrared spectral Thematic Mapper Data will be available for vegetation of the Granite Butte project area through the EROS service based in Ohio, by fall 1991. This type of vegetation base data will require some level of ground truthing, but in comparison to existing data bases, from a variety of sources, it will be highly accurate and may simply be scanned into the GIS system when it becomes available. This option is being further explored.

Watersheds will be manually mapped and digitized based on land areas suitable to both wildlife and land use management considerations. Watershed mapping has not been initiated.

Roads that appear on the 7½ minute quad maps are being identified and numbered, and roads that are known to exist but do not occur on the quads are being included. No ground truthing has been conducted but efforts to quantify road densities will be made in selected areas. Known roads on private lands have been mapped on five quads. Known roads on both private and public lands have been mapped on two quads. Digitizing has been completed for two quads.

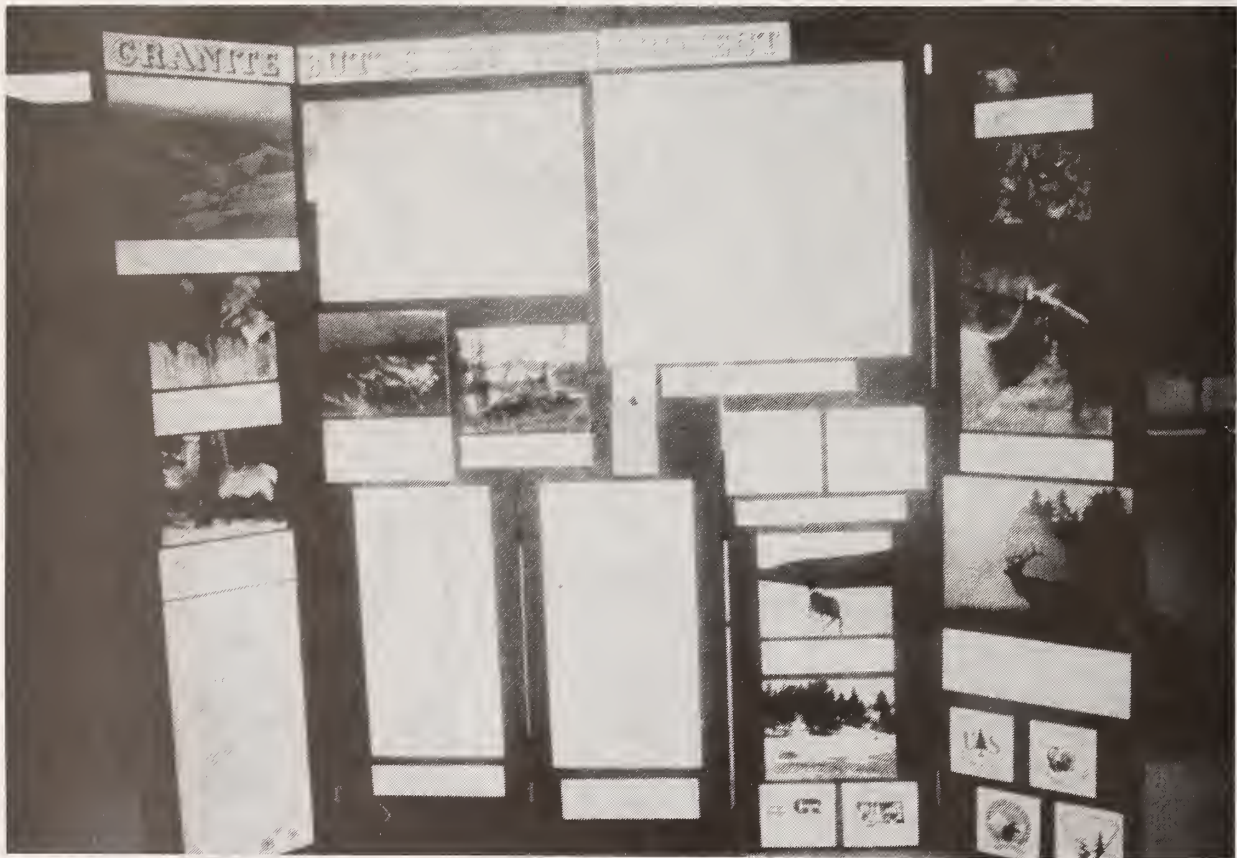


Figure 10. Poster display of Granite Butte GIS Elk Project.

Resource and use data that will be incorporated during the life of this project include: livestock grazing allotments, timber programs, mining activities, military affairs exercise areas, subdivisions and rural development.

Promotion: A poster display (Fig. 10) of the project was constructed and displayed at the The Wildlife Society - Elk Vulnerability Symposium in Bozeman, at the Safari Club Convention in Billings, in the lobby of the Helena Fish, Wildlife, and Parks office, and at the Billings Fair. Various literary and media pieces were written and distributed to the media and appeared in BUGLE, the official publication of the Rocky Mountain Elk Foundation.

Table 1

ELK CAPTURED AND MARKED IN HUNTING DISTRICT 439

Frequency	Collar		Eartag		Age	Sex	Diameter (in.)	Capture Method	Drainage - Section	Date	Status of Animal
	Color	Symbol	Right	Left							
151.061	Grn w/yel	⊙	26324	26323	6	F1/	103	dart	Log Gulch	4-5-88	
151.081	Yellow		26322	26321	9	F*	109	dart	Oxbow	4-4-88	
151.240	Grn w/wht	—	26318	26317	6	F1/	110	dart	Oxbow	4-5-88	
151.261	Red w/wht	M	26320	26319	4	F*	112	dart	Oxbow	4-4-88	
151.331	Grn w/yel	++	26328	26325	2.5	F*	---	dart	Log Gulch	4-5-88	Shot 11-16-89
151.051	Grn w/yel	~~~~~	26318	26317	7	F1/	115	dart	Big Sheep	2-29-88	Shot 10-21-90
151.071	Grn w/yel	• • • •	26311	26312	7	F*3/	112	dart	Big Sheep	3-29-88	Yellow neckband blk "2" 3/5/89
151.091	Grn w/yel	M	26310	26309	6	F*	109	dart	Big Sheep	2-29-88	Shot 11-24-89
151.111	Grn w/yel	▲	26315	26316	2.5	F*	112	dart	Big Sheep	3-29-88	illegal 10-31-89
151.151	Grn w/yel	H	26306	26305	2.5	F*	107	dart	Big Sheep	3-29-88	
151.161	Grn w/yel	▲	26329	26330	1.5	F	90	dart	Med. Rock	4-5-88	
151.191	Grn w/yel	□	26303	26304	8-10	F*	115	dart	Big Sheep	3-29-88	
151.221	Grn w/ yel	●	26308	26307	5	F*	110	dart	Big Sheep	3-29-88	
151.320	Grn w/yel	2	26301	26302	10+	F*	107	dart	Big Sheep	3-29-88	
150.293	Wht w/blk	♦	23627	23635	1.5	F1/	---	dart	Rattlesnake	3-5-890	
151.312	Grn w/yel	Y	23628	23637	5	F*	---	dart	Rattlesnake	3-5-89	Found Dead 8-6-90

June 1991

1/ Not pregnancy tested * = Pregnant

2/ Color and type of collar, eg. grn belt = green belting, pvc = hard plastic collar, color of "symbol"

3/ Radio-collar removed 3-5-89 and replaced with yellow neckband with "2" symbols

Table 2

ELK CAPTURED AND MARKED IN HUNTING DISTRICT 443

Frequency	Collar		Eartag		Age	Sex	Diameter (in.)	Time		Drainage - Section	Date	Status of Animal
	Color	Symbol	Left	Right				Down	Up			
150.121	Wht w/blk	—	23661	23660	1.5	F1/	3.7	5.0	2.5	Ogilvie Cr. SW7	1-19-90	
150.161	Wht w/blk	M	26389	26390	0.5	M	3.54	4.0	4.0	Blue Cloud Cr. NW13	1-20-90	
150.171	Wht w/blk	Y	23653	23652	8.5+	F*	4.61	35.0*	6.0	Missouri Gul N15	1-20-90	
150.192	Wht w/blk	-	26382	26376	3.94	F*	—	4.0	2.0	Pikea Gul NW30	1-19-90	
150.281	Wht w/blk	★	26380	26376	6.5	F*	4.31	18.0	4.0	Cottonwood Gul E29	1-19-90	
150.361	Wht w/yel	Y	26378	26393	6-8	F*	4.33	26.0*	1.0	Blue Cloud NE14 2/	1-20-90	Shot 12-3-90
150.440	Wht w/blk	-	26387	26386	3.94	F*	3.94	8.0	8.0	Ogilvie Gul NW7	1-19-90	
150.501	Wht w/yel	-	23658	23659	6.5	F*	4.75	4.0	2.5	Ogilvie Gul SW7	1-19-90	
150.901	Wht w/blk	3	26378	26379	2.5	F*	—	37.0*	8.0	Tarhead Cr NE29	1-19-90	
151.091	Wht w/blk	+	26415	26416	6.5	F*	3.94	22.0	2.5	Empire Cr SW29	2-26-90	
151.121	Wht w/blk	Y	26384	26379	2.5	F*	3.92	6.0	6.0	Marsh Cr NE36	1-19-90	
151.351	Wht w/blk	♥	26377	26376	6.5	F*	4.37	8.0	4.0	Tarhead Cr SW28 3/	1-19-90	
151.431	Wht w/blk	H	23666	23664	8.5+	F*	4.31	18.0	1.0	Blue Cloud W19	1-20-91	
151.441	Wht w/blk	+	23671	23670	3.5	F*	—	17.0*	2.0	Sears Cr S22	1-19-90	
151.521	Wht w/blk	+	23668	23669	8.5+	F*	4.0	10.0	3.0	Virginia Cr N22	1-19-90	
151.531	Wht w/blk	●	23673	23672	0.5	M	3.44	5.0	2.5	Sears Cr SE22	1-19-90	

June 1991

1/ Not pregnant, * = pregnant

1/ Both center incisors missing, but fat, in good shape, and resistant to drug.

2/ Appeared to be in moderately poor shape. Not fat, slow to recover.

Biologist - Gayle Joslin

Veterinarian - Dick Kinyon

Pilot - Doug Getz (Hughes 500)

ELK INVENTORY

Marking: Thirty-two elk, including 30 females and two bull calves, have been marked within HD439 (Table 1) and HD443 (Table 2) of the Granite Butte Project area. One of two elk marked in HD435 (Appx 9) south of Helena in the Deerlodge EMU, has taken up permanent residence in HD443, while the other utilizes both HD443 and HD435.

Clinical pathology testing results indicated that all captured elk tested negative for brucellosis, bluetongue, and anaplasmosis. Positive tests for IBR, BVD, PI3, and leptospirosis indicates that elk have either been exposed to the virus or display no immune response to that particular virus. Of 31 elk tested, 8, 2, 20, and 25, tested negative for IBR, BVD, PI3 and leptospirosis, respectively, while 23, 29, 11, and 6 had been exposed to the respective viruses.

Blood profile data was collected on the 16 elk captured and marked in HD443 during 1990 and is presented in Appendix 10. These are baseline data for individual animals that may be useful for comparative reference in the future. Normal ranges are provided for large animals and are not necessarily specific to elk.

Monitoring: Thirty-four elk have been radio-marked in the project area since 1988. Four elk have been legally harvested. One marked elk was a hunting season wounding mortality, and another was found dead in August.

Collective home range analysis for radio-marked was generated using the convex polygon method, determined with Telday software. The following are results of seasonal distribution analysis:

	AREA (Sq.mi)	#FIXES	Mean	ELEV Max	Min
Spring	679	196	5117	6800	3800
Calving	718	112	5314	6800	4100
Summer	723	278	5328	7600	3600
Fall	737	145	5491	7400	3900
Winter	715	313	5296	7000	3800
Yearlong	931	1048	5303	7600	3600
Winter*	753	395	5327	7600	3600
Yearlong*	980	1280	5327	7600	3600

*Radio-marked elk plus elk observed in HD293, HD439, and HD443 that were not associated with radio-marked elk.

Once mapping capabilities for the entire area are completed, it will be possible to visually compare seasonal distribution areas. It must be cautioned that radio-marked elk do not reflect all elk use of the Granite Butte EMU. Elk data in this system should be used as a guide to help direct land management activities, but a lack of records for an area cannot be interpreted as non-use by elk without on-site seasonal reconnaissance. Individual yearlong and seasonal home range analysis can be compiled for each radio-marked elk. These data are available upon request.

Current seasonal elk data base information, generated through the GIS system, is illustrated in Figures 11-15. Each symbol represents from one radio-marked elk up to 320 elk in a single group.

SEASONAL ELK DISTRIBUTION

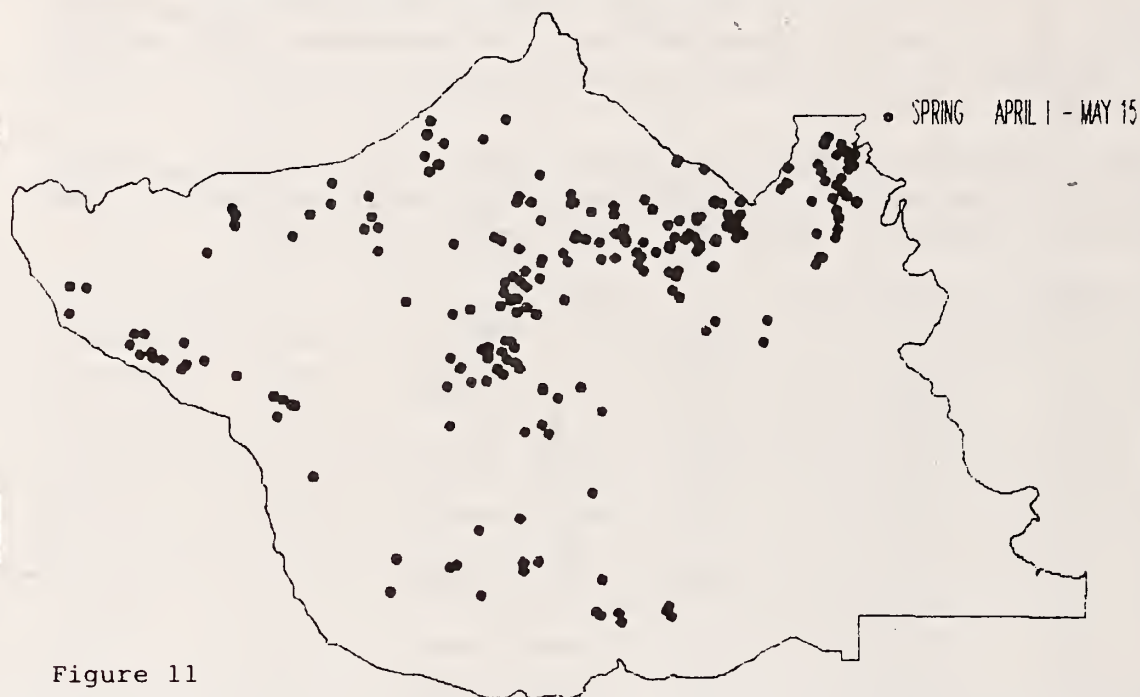


Figure 11

SEASONAL ELK DISTRIBUTION

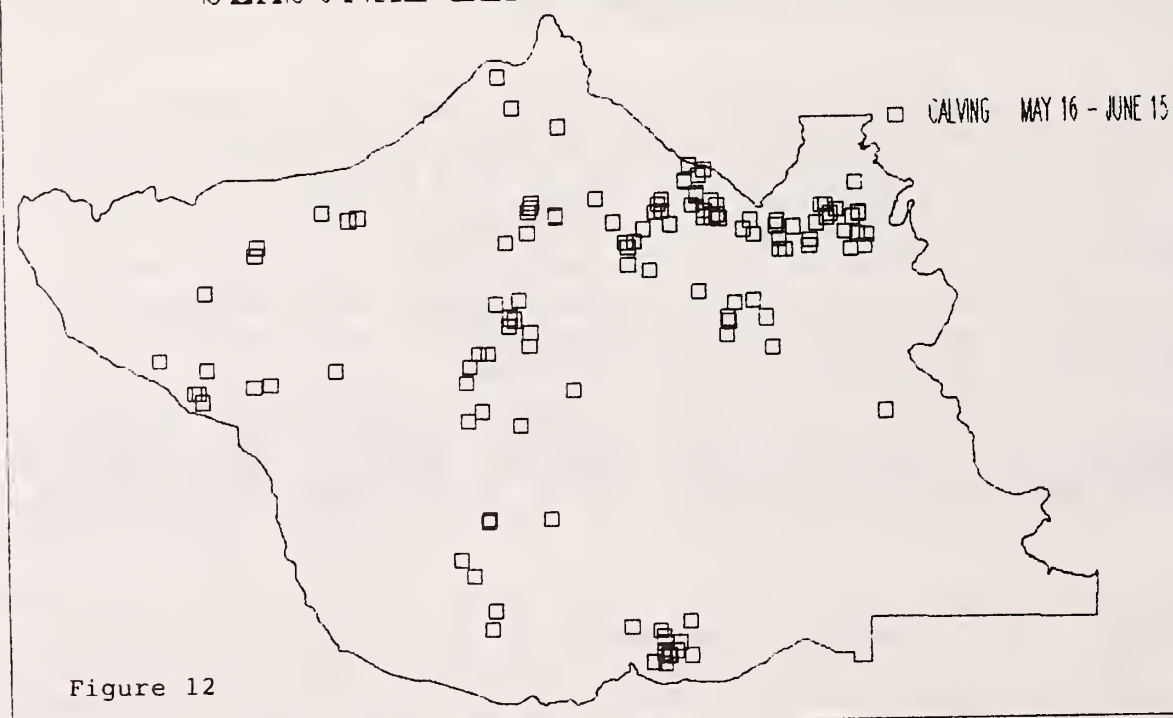


Figure 12

SEASONAL ELK DISTRIBUTION



Figure 13

SEASONAL ELK DISTRIBUTION

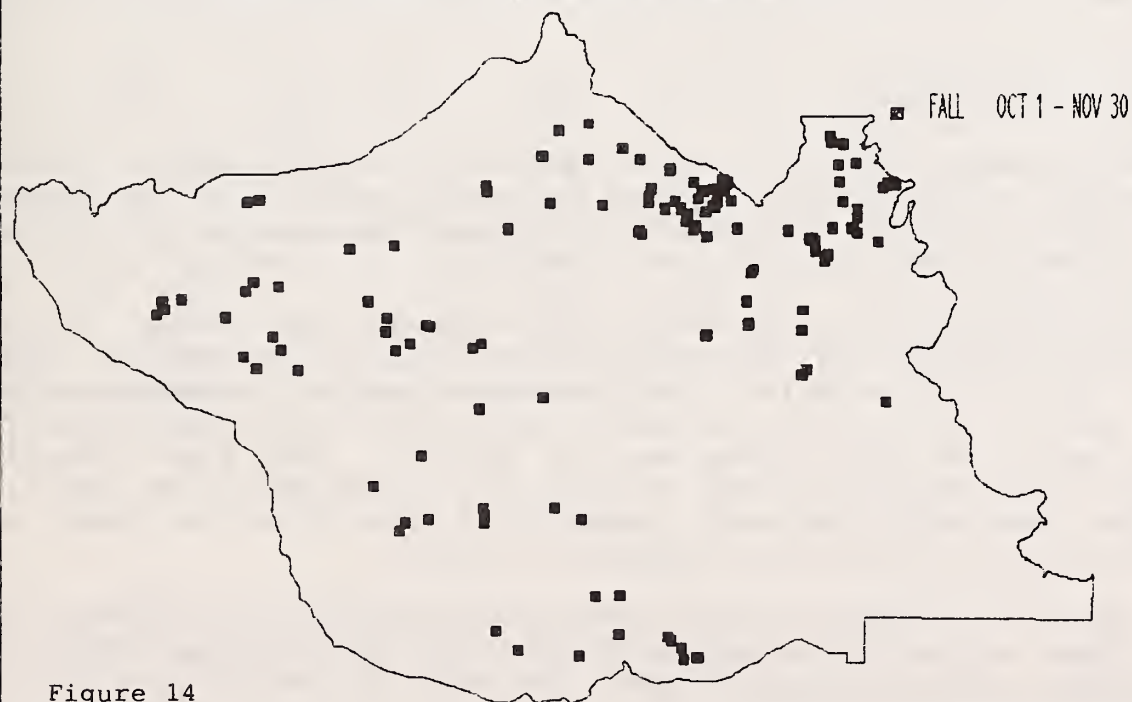


Figure 14

SEASONAL ELK DISTRIBUTION



Figure 15

Public Involvement:

Hunter Opinion Survey - Total responses to the hunter opinion survey for the Granite Butte EMU was 45.5% (HD293 = 27.5%, HD439 = 60%, HD443 = 63.3%). Appendix 7 provides the combined survey data from hunting districts 293, 439 and 443.

Hunters hunted primarily with a rifle (81.1%) and on foot (64.5%) and/or horseback (16.7%). Only 18.8% hunted by vehicle, trail bike, ATV, or snowmobile. Sixty-seven percent of respondents felt that vehicle access was adequate, while 22.8% felt there was too much, and 9.8% felt there was too little. The most important reasons for selecting the Granite Butte EMU were: to be in a natural setting, for meat, because it was close to home, and because no permission was required to hunt.

They generally felt that the total elk population was stable, but the total number of branch-antlered bulls in the population had decreased. When queried whether they were satisfied with the

current opportunity to see brow-tine bulls, 60% of the respondents in HD443 said YES, while the majority of hunters in HD293 and HD439 said NO. This difference is likely a reflection of A-7 license holders in HD443 who in fact could not hunt for bulls. Hunter opinions varied on the subject of elk population and composition depending upon which of the three hunting districts they hunted. Those who hunted HD293 felt that the population was stable or increasing but that the total bulls and branched bulls were stable or decreasing. In HD443 hunters felt the population was stable or decreasing as was the bull segment of the population, but were happy never-the-less with the opportunity to see branch-antlered bulls. Conversely, in HD439, hunters felt the population was increasing but that total bulls and branched bulls were also increasing. This may have been a reflection of the road management program occurring within this hunting district for the past two years. This program may have resulted in more bulls in the area since open road densities have decreased and elk security has thus increased.

For the Granite Butte EMU as a whole, hunters rated their hunting experience as OK (44.4%), Excellent (42.8%), and Poor (12.8%). However, hunters using HD439 seemed to be the most satisfied with their experience in that 66.6% rated it as Excellent, while only 38.9% from HD293 and 34.5% from HD443 rated their experience as Excellent. The hunter opinion survey may be conducted again in 1991 to increase the sample base, if funding permits.

HD439 Road Management - Hunter Survey: Hunters using HD439 were contacted throughout the hunting season to assess their attitudes relative to the Road Management Program that was implemented on the Sieben and Chevallier ranches. One hundred sixty-seven hunters were polled. Ninety-four percent of the respondents were from Helena (84%) or Great Falls (12%). Sixty-six percent had hunted HD439 for three years or less while 28% had hunted for four years or more. Ninety-seven percent liked the Designated Roadway concept, 66% felt that vehicle access was just right, 22% said there should be more roads open, and 9% felt there should be fewer. All hunters appreciated that they did not have to ask permission to hunt, and they all felt that the landowners were accommodating. Several unsolicited comments were received, ranging from "the hunting is much better since they closed the roads" to "there are no big buck/bulls in here any more".

RECOMMENDATIONS

Relative to elk management within the Granite Butte EMU, during 1991-92 several issues will be addressed: hunter perceptions, landowner concerns, hunting pressure, and elk security. A recommendation will be made to the Fish, Wildlife & Parks Commission to divide HD439 into two hunting districts. A new district may be created east of Interstate 15, and that portion of HD439 west of I-15 would retain the title HD439. This change will help distribute hunters into the more difficult to hunt, and less accessible country east of the Interstate, and control potential overharvest west of the Interstate.

Dwindling elk security continues to be a problem, and needs to be carefully scrutinized at both the individual project level and at the GIS project level within each land management agency and with FWP. Specific measures need to be taken to decrease densities of roads and trails (both open and administratively closed) to motorized vehicles, and to maintain large blocks of unroaded timber.

A new approach toward land stewardship needs to be implemented at the agency level that would allow for comprehensive resource planning. Currently, baseline resource data is collected for an analysis area at the project level just prior to project implementation, rather than drawing from comprehensive resource data bases that have been compiled for a unit of land, such as the Granite Butte project area. Such comprehensive resource data bases need to be compiled and consistently updated if conscientious land stewardship is to result from this project.

A set of elk management terms, such as that produced by Lyon and Christensen (1990) will be adopted and used during this project. Standardized terminology will foster clarity and simplify interagency communication.

Specific land use and wildlife management recommendations will evolve as a result of this project.

PROJECT PROJECTIONS FY92

PROJECT TASKS

During the next fiscal year the project Charter will be finalized and distributed for participating agency and organization endorsement.

Project accomplishments are keyed to project funding. Tasks scheduled for completion during FY92, but contingent upon funding include:

- ° Base Data Theme (7 themes) completion for the digitized mapping system of all 34 topographic maps (entire Granite Butte project area)
- ° Resource Data Themes and tabular information for preliminary roads, soils, vegetation, and watersheds - for 16 of the 34 topographic maps
- ° Data Dictionaries for each of the above resource themes
- ° Elk Resource Theme updated annually in Feb-Mar
- ° Capture and mark 10-15 elk in the Dog Creek and Ophir Creek areas, and possibly the east North Hills area; monitor these and 26 existing radio-marked elk

FINANCIAL CONTRIBUTIONS

The FY91 break down of financial contributions includes agency personnel time. This figure may vary in the future depending upon task priorities. The funding request for FY92 (July 1991 - June 1992) includes only operations and the research aide position that is responsible for compiling, coordinating, and mapping the majority of the resource theme data.

FY91 CONTRIBUTIONS				
Agency	Personnel	Operations	Total	%
FWP	16,800	11,200	28,000	31
BLM	24,000	4,000	28,000	31
HNF	8,000	6,000	14,000	15
Phelps D.		4,500	4,500	5
RMEF			16,000	18
TOTAL			90,500	100

FY92 BUDGET REQUEST

PERSONAL SERVICES

Research Aide	\$26,900
---------------	----------

OPERATING EXPENSES

Elk Capture and Marking	
Veterinarian, drugs, darts [\$200x12elk]	2,400
Helicopter	3,000
Transmitters [12 @ \$267/elk]	3,200
Collars/Color Coding/Assembly [\$15/elk]	180

Elk Monitoring	
Fixed-wing relocations [\$85/hrx5hrx18/yr]	7,650
Annual Surveys [\$220/hrx10hr/hdx3hds]	6,600*

Data Compilation & Manipulation	
Training	400
Contracted Services	1,000
Cartography	600
Printing	600
Maps/Mapping Supplies	250
Computer supplies	200
Copying Costs	100

Travel	
Mileage	2,000
Per diem	840
Lodging	250

TOTAL	<hr/> \$49,570
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*contributed by FWP, not included in total

CONCLUSION

The Granite Butte Elk GIS Project was initiated as a cooperative effort to develop and maintain a comprehensive, multi-owner database to facilitate environmental analysis of proposed actions. The project's goal is to ensure that elk and elk habitat will continue to be an important aspect of Montana's heritage, to be enjoyed by the people of Montana and visitors to the state. Public interest in elk, and the fact that elk quickly respond to changes in environmental conditions, provide the rationale for the project and implementing a GIS program.

The benefits of this project will include: maintaining or improving elk populations and habitat, developing a means to identify cumulative impacts of proposed actions affecting elk and their habitat, and to test the feasibility of the project's design on other areas.

In the short-term, the Granite Butte GIS Elk Project will provide a digital inventory of land use activities, habitat characteristics, and elk distribution. In the long-term, it will provide a tool for analysis of management activities. Potential advantages of this project include:

- Facilitate information exchange, cooperative management, coordination of land use activities, and partnerships between land managers. The effort to develop and maintain the database should also lead to better communications that are needed for biologically sound resource management.

○ Provide an up-to-date visual display of spatial relationships between land use activities, habitat characteristics, and elk use. Visual displays will help focus attention on relationships needing further investigation, such as consequences to elk from roads, vegetation manipulation, or mineral exploration and extraction.

○ Provide an inventory and display of complete road systems for travel management planning.

○ Visual display of seasonal elk distribution, movements, and habitat use that will facilitate identification of key habitat areas throughout the Granite Butte project area. This will provide important information for management decisions concerning land use activities in specific elk use areas.

○ Provide a broad picture of an entire EMU that will facilitate realistic long-term project planning based on resource conditions rather than a reactive response to commodity proposals. Better analyses and planning at the broader level should result in less controversy and more defensible decisions at the project level, as well as better land management.

○ Facilitate site-specific and cumulative effects analysis.

○ Assist in identification and development of mitigation and enhancement opportunities.

○ Provide an interactive management tool to allow prediction of effects of various management alternatives and develop recommendations for land uses. The GIS provides an instrument to combine various land use scenarios and to visually display the results.

Approximately 18 months of effort have been invested in designing, coordinating, and implementing the Granite Butte Elk GIS Project. It is hoped that this cooperative interagency endeavor may prove to be a useful prototype for land and wildlife stewardship programs in other areas of the state.

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Appendix 1. PROJECT PARTICIPANTS

Thanks are extended to all of the following individuals who have participated in this project by providing technical assistance, support, direction, advise and information.

BLM: Larry Rau, Wildlife Biologist - Butte District Office
Paul Peek, Natural Resource Specialist - Butte
Mike Small, Silviculturist - Butte
Kathie Jewell, Supervisory Computer Specialist - Billings
Randy Schardt, Cartographic Technician - Billings
Donna Degner, Computer Programmer Analyst - Billings
Kevin Brooks, Computer Operator - Billings
James Chapman, Cartographic Technician - Billings
Dennis Leonard, Cartographic Aide - Missoula
Bob Haburchak, State Wildlife Management Biologist - Billings
Ray Hoem, Natural Resource Specialist - Billings

Conrad Veterinary Clinic
Richard Kinyon, DVM - Conrad

Forest Service Regional Office
Wendel Hann, Ecosystem Management - Missoula
Jack Lyon, Project Leader Wildlife Habitat - Missoula
Alan Christensen, Wildlife Mgmt/Budget Coordinator - Missoula
Mark Jensen, Ecosystem Analysis/RNA Coordinator - Missoula
Bill Tanke, Operations Research Analyst - Missoula

HNF: Kathy Bulchis, Forest Wildlife Biologist - Helena
Barry Paulson, District Wildlife Biologist - Lincoln
Doug Grunenhoff, Biological Technician - Lincoln
Lois Olsen, Range Conservationist - Helena
Alan Dohman, District Wildlife Biologist - Helena
Cindi Confer, Assistant Wildlife Biologist - Helena
Marie Dunlap, Range Assistant - Helena
Vicky MacLean, Range Technician - Helena

Lewis & Clark County Planning Office
Bob Rasmussen, County Planner - Helena

MDFWP: Gayle Joslin, Wildlife Biologist - Region 8
Denise Boggs, Research Aide - Region 8
Dan Hook, Wildlife Biologist - Region 2
Steve Knapp, Bureau Chief Habitat - Helena State Office
Terry Lonner, Assistant Bureau Chief Research - Bozeman
Heidi Youmans, Special Projects Coordinator - Helena
Doug Getz, Pilot
Bill Winninghoff, Pilot

Montana Department of State Lands

Alan Wood, Wildlife Biologist - Missoula
Brian Long, Supervisor Inventory Section - Missoula
Garry Williams, Manager Forest & Lands Program - Helena
Allen Branine, Helena Area Forester - Helena
Richard Grady, Land Use Specialist - Helena

NRIS

Jon Sesso, Director of NRIS - State Library, Helena
Jim Stimson, Water Information Specialist - Helena

Powell County Planning Office

Chris Miller, County Planner - Deer Lodge

Red Mountain Resources - Helicopter Charter & Maintenance

Monte Ballou - Helena

Rocky Mountain Elk Foundation

Gary Burnett, Regional Representative - Bozeman
Jeff Brandt, Montana State Chairman - Helena
Lance Schelvan, Communications - Missoula

Seven Up Pete Venture

Steve Enders, Project Manager - Lincoln
Chuck Rose, Environmental Coordinator - Butte

Soil Conservation Service

Warren Kellog, District Conservationist - Helena
Kristin Gerhart, Cartographer/GIS Specialist - Bozeman
Valorie Ericson, Biological Aide - Deer Lodge

**CHARTER
GRANITE BUTTE
ELK GIS PROJECT**

Introduction

The Granite Butte Elk Project is a cooperative effort to develop and maintain a comprehensive, shared data base to facilitate environmental analysis. Public interest in elk, and the fact that elk quickly respond to changes in environmental conditions, provide the rationale and focus for this project. Project participants include the Montana Department of Fish, Wildlife and Parks, the Montana Department of State Lands, the Bureau of Land Management, the U. S. Forest Service, the Rocky Mountain Elk Foundation, and the Seven-Up Pete mining Venture.

The Granite Butte project area is one of 35 elk management units in Montana managed by the Montana Department of Fish, Wildlife and Parks. The unit encompasses four elk hunting districts covering approximately 1,300 square miles of public and private lands. The public lands are managed by the United States Forest Service, the Bureau of Land Management, and the Montana Department of State Lands. These lands, in addition to sustaining an exceptional wildlife resource, also support timber harvest, mineral development, livestock grazing, subdivision and rural homesite development, agriculture, and recreational activities.

The statutory authority, and/or mission statement of each of the participants includes a commitment or management guidance for fish, wildlife, and recreational opportunities. The Montana Department of Fish, Wildlife and Parks (MDFWP) was established by the State legislature (Sec. 2-15-3401), and directed to oversee stewardship of Montana's fish and wildlife, and management of recreational opportunities (Title 87 and 23 MCA, MEPA Title 77 MCA, and other MCA sections). The U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Montana Department of State Lands (MDSL) manage land use activities on public lands within their jurisdictions, including recreation and fish and wildlife habitat. The federal agencies have legal mandates described in the National Environmental Policy Act (P.L. 91-190 42 U.S.C.4321-4347, as amended), Endangered Species Act of 1973 as amended (P.L. 93-205, 87 Stat. 884 cit. seq., 16 U.S.C. 1331 cit. seq.), Forest and Rangeland Renewable Resources Planning Act, as amended (88 Stat. 476;16 U.S.C. 1601-1610 - for USFS), Federal Land Policy and Management Act of 1976 (P.L. 94-579, 43 U.S.C. 1701, et seq.) and Fish and Wildlife Coordination Act (P.L. 86-624, 16 U.S.C. 666f. - for BLM) that refer to fish and wildlife habitat as well as other environmental issues and concerns. The Montana Environmental Policy Act (Title 77 MCA) and Montana Enabling Act dictate direction for the MDSL. There are a variety of other state and federal statutes that influence resource and land use decisions on public lands.

The mission of the Rocky Mountain Elk Foundation (RMEF), in part, is to fund projects which will: "perpetuate wild free-ranging elk populations . . . encourage sound management of elk, other wildlife and their habitat based on objective scientifically based data foster cooperation among federal, state, provincial and private organizations in wildlife and habitat management".

The Seven-Up Pete Venture (SUPV), a joint venture between Phelps Dodge Mining Company and Canyon Resources Corporation, is exploring for minerals within the Granite Butte Unit. Included in the Venture's goals is a commitment to consider environmental issues in all phases of project planning. Wildlife habitat and recreational considerations are important components of this goal.

Mission Statement

The GOAL of this project is to ensure that elk and elk habitat will continue to be an important aspect of Montana's heritage, to be enjoyed by the people of Montana and visitors to the state. Toward that goal, this pilot project is designed to:

- Maintain or improve elk populations and habitat, elk hunting opportunity and elk-related experiences within the Granite Butte Unit by developing close coordination between participants
- Develop means to identify cumulative impacts of proposed actions upon elk, their habitat, and recreation opportunity, and recommend cooperative actions to be implemented by land and wildlife management agencies
- Test the feasibility and applicability of this approach to other areas.

OBJECTIVES of this project are to:

- Develop a coordinated approach to management of elk and elk habitat on public lands
- Devise management strategies to minimize displacement of elk from public to private lands and consequently reduce private landowner concerns
- Enhance public opportunities to hunt, view and otherwise enjoy elk on public lands and maintain or improve public hunting opportunity on private lands
- Facilitate the exchange of information between land managers needed for cumulative effects analyses

- Develop a Geographic Information System (GIS) data base planning tool to help accomplish these objectives
- Promote public understanding and appreciation of elk habitat needs using GIS generated graphic displays of elk habitat and land uses in the Granite Butte Unit

The GIS technology will contribute to project goals and objectives by visually displaying the seasonal distribution, habitat and security needs of elk, and the impacts of habitat modifications from competing land uses. Additionally, this project will identify cumulative impacts to elk habitat and hunting opportunity. This will provide a framework to recommend preventive and/or remedial actions to management agencies. The most recent information available for the area can be displayed using GIS technology. It will be a valuable device in fostering resolution of complex interagency issues.

This cooperative approach will illustrate the impact on elk habitat from competing uses, and will propose options to balance elk habitat necessities while accommodating other uses. This technology will illustrate the demands being made upon the land, and will help identify problems that management prescriptions must resolve.

Project Organization

The Granite Butte GIS Elk Project is designed to be a team approach to resource management issues. A two-tiered committee structure shall direct this project. They will be a STEERING COMMITTEE comprised of management representatives from each participating entity, and a series of TECHNICAL COMMITTEES composed of resource experts from some or all participating entities. A CHAIRPERSON will oversee the progress of the project and be responsible for calling all Committee meetings.

STEERING COMMITTEE structure:

<u>Agency</u>	<u>Position Title</u>	<u>Alternate</u>
MDFWP	Wildlife Habitat Bureau Chief (Helena)	Wildlife Program Officer (Bozeman)
MDSL	State Wildlife Biologist (Missoula)	
BLM	Wildlife Program Leader (Billings)	Resource Area Biologist (Missoula)
USFS	HNF Wildlife Biologist (Helena)	Wildlife Mgmt/Budget Coord. (Missoula)
RMEF	Field Director (Bozeman)	
SUPV	Environmental Coordinator	

Functions of the STEERING COMMITTEE are to:

- provide oversight and general project direction
- keep participating agencies, organizations, and the public informed of project progress
- facilitate coordination of agency projects within the planning area to reduce or eliminate cumulative impacts on elk or their habitat
- make the GIS data base accessible to the contributors
- negotiate funding and time commitments to ensure data collection and entry, maintenance of the data base, and user training for the GIS system.

TECHNICAL COMMITTEE structure:

ELK SUBCOMMITTEE

Agency	Position Title	Location
MDFWP	Wildlife Biologist - Region 8*	Helena
	Wildlife Biologist - Region 2	Anaconda
BLM	Resource Area Wildlife Biologist	Butte
USFS	District Wildlife Biologist	Helena
	District Wildlife Biologist	Lincoln

VEGETATION SUBCOMMITTEE

Agency	Position Title	Location
USFS	Ecosystem Management*	Missoula
	Ecosystem Management	Missoula
	District Range Conservationist	Helena
BLM	Resource Area Forester	Butte
NRIS	NRIS Coordinator	Helena
SCS	District Conservationist	Helena

LAND USE SUBCOMMITTEE

Agency	Position Title	Location
USFS	District Wildlife Tech*	Lincoln
	District Wildlife Biologist	Helena
MDFWP	Wildlife Biologist -Region 8	Helena
	Research Aide - Region 8	Helena
	Wildlife Biologist - Region 2	Anaconda
BLM	Resource Area Wildlife Biologist	Butte

DATA MANAGEMENT SUBCOMMITTEE		
Agency	Position Title	Location
BLM	State GIS Coordinator*	Billings
	Resource Area Cartographic Aide	Missoula
	Natural Resource Specialist	Butte
HNF	Ranger District Range Specialist	Helena
	Operations Research Analyst	Missoula
	Ecosystem Management	Missoula
MDSL	Inventory Section Supervisor	Missoula
MDFWP	Programmer Analyst	Bozeman

Functions of the TECHNICAL COMMITTEES are to:

- compile, analyze, and enter resource data and maintain quality control
- outline analysis needs
- identify needed coordination for agency projects within the planning area
- provide information for resource planning, project development, and analysis of alternatives and impacts
- define and incorporate standard land use, and elk population and habitat terminology into the application of the GIS data base
- develop elk population and habitat management recommendations
- design the data base to interface between user hardware
- maintain data dictionaries for each spatial data theme and associated tabular data
- update the GIS data base at prescribed intervals
- systematically document development of the GIS data base.

CHARTER PRINCIPLES

The signatory parties to this document agree to support the following principles of this Charter:

- The GIS data base will be updated regularly by incorporating data, plans, land use proposals and other relevant information.

- Projects or activities proposed to take place within the planning unit will be analyzed using the GIS data base by the agency proposing or permitting the project or activity. The analysis will be available to participating agencies upon request, to broaden the scope of participation and reduce or avoid impacts to wildlife. Mitigation and compensation measures may be factored into the GIS data base for analysis.
- The GIS tool is designed to display the most recent information available for the planning area, and will be employed to aid in analysis. It is expected to foster resolution of complex interagency issues.

The Granite Butte GIS Elk Project is designed as a team approach to resource management issues. GIS planning and analysis technology will advance and facilitate interagency coordination and cooperation. The undersigned parties endorse the cooperation between participants to promote sound resource stewardship, support development of the GIS tool, and increase the level of elk awareness in the Granite Butte area.

This Charter does not obligate funds by participants. Participants agree to consider this to be a priority project and will cooperate in joint funding when funds are available. This agreement may be terminated by mutual consent or by any party upon 30 days written notice. The Charter will remain in effect until terminated by the signatory parties.

(February 26, 1991)

Cooperating Agencies and Organizations

K. L. Cool, Director DATE
Montana Department of
Fish, Wildlife & Parks

Ernie Nunn DATE
Supervisor, Helena National
Forest

Thomas Lonnie DATE
State Director (acting)
Bureau of Land Management

Robert Munson DATE
Executive Director
Rocky Mountain Elk Foundation

Steve Enders DATE
Project Manager
Seven-Up Pete Venture

Dennis Casey, Commissioner DATE
Montana Department of
State Lands

Appendix 3. Timber sales occurring and proposed on the Granite Butte Project Area.

SALE NAME	MMBF	ACRE	YEAR	ROADS	AGCY	COMMENTS
Paydirt	1.4	132	91	0/.1/.3	HRD	
Hope-Snowshoe	1.3	132	91	4/.7/.1	HRD	
McQuithy	0.3	52	91	0/ 0/.1	HRD	
Sweeney	0.5	350	91	.7/.8/0	HRD	
E.Fk.Willow	2.5	542	91	3.5new	LRD	
Sheldon G.	1.2	280	91	1.6new	LRD	
Baldy	1.37	116	90		LRD	
Clear Creek	0.94	168	90		LRD	salvage
Madison G.	0.49	45	90		LRD	
Wasson Cr.	3.25	307	90		LRD	
Camp	1.05	109	90		LRD	
Sourkraut	3.06	217	90		LRD	
Gold Red	0.66	86	91		LRD	
Mullan Pass	2.0	325	92	2/2/.5	HRD	
Cave Gulch					HRD	
Dead Uncle					HRD	
Cellar Gulch					HRD	
Deadman II					HRD	
Left Hand Fk					HRD	
Empire Cr	1.5		93	new rds	BLM	
L.Prickly Pr	1.5		93	new rds	BLM	
Marysvl C Pl	20.0		95-10	new rds	BLM	
Ogilvie Gul	0.6	120	93		DSL	
Towhead Gul	0.48	94	91	no new	DSL	
Lyons Cr	1.1	141	91	3.0new	DSL	11 units
3 Mile Cr	0.66		88		DSL	
Short Log	0.52		91		DSL	
Pikes Gul	0.71		88		DSL	

GRANITE BUTTE EMU

(Hunting Districts 284, 293, 439 and 443)

Description: The 1,230-square mile Granite Butte EMU extends from the Missouri River on the east to Mineral Hill at the junction of Highways 200 and 141 on the west, and from Avon to East Helena along U.S. Highway 12 on the south to Lincoln and Holter Dam on the north. About 50% of the EMU is national forest land and 10% is controlled by the BLM. The Continental Divide bisects the unit and includes MacDonald, Priest, Stemple, Flesher and Rogers Passes.

Public Access: This EMU is almost entirely open to hunting. Access is plentiful for hunting and other forms of public recreation.

Elk Populations: The elk population has shown moderate but steady increases during the past 10 years and currently stands at approximately 1,800. Elk security on public and private lands has become limited in areas where timber harvest has reduced cover and roads have increased accessibility. On private lands, recreationists have driven off of existing roads, impacting elk security through creation of new travel routes. Bull:cow ratios are generally low. The frequency of dame depredation complaints are low to moderate.

Recreation Provided: Year-long recreational use of the unit includes hunting, photography and viewing opportunities. This EMU provides 21,000 days of hunting recreation to 4,000 hunters, annually. Boat tours along the Missouri River feature wildlife viewing.

Harvest: Hunters harvest 320 antlered and 130 antlerless elk each year. One percent of harvest bulls have 6 or more antler points. Approximately 18% of the yearling bulls have branched antlers.

SUMMARY OF PUBLIC COMMENT

Public input indicates an interest in increased numbers of older bulls, higher bull:cow ratios and fewer guides and outfitters. There also appears to be some concern among sportsmen that the 6-week archery season is too long.

DRAFT MANAGEMENT GOAL

To manage the elk population in optimum productive condition, and to cooperate with private and public land managers in the management of elk habitats in order to provide diverse elk harvests and hunting opportunities. Emphasis will be directed at maintaining hunter opportunity by pursuing habitat management

objectives, rather than limiting hunters through more restrictive regulations. Both hunting opportunity and elk security can be maintained through proper land use management. Habitat management objectives will take priority over other objectives.

DRAFT HABITAT OBJECTIVES

- 1) To develop cooperative programs that encourage private and public land managers to maintain 623,000 acres of occupied elk habitat.
- 2) Maintain elk security so that the elk harvest is distributed throughout the season, with no more than 35% of harvested bulls being taken during the first week of the general season.
- 3) Identify areas where modification of land management practices is needed to improve elk habitat security.
- 4) Improve the ability of public lands to sustain wintering elk, particularly in hunting district 443 where publicly owned elk winter range is limited, and where elk traditionally move from west (HD 293) to east (HDS 443 and 439) of the Continental Divide to winter.
- 5) Work with public land managers to reduce open-road densities, and maintain or improve hiding cover.
- 6) Implement road management programs on private lands where landowners are experiencing problems resulting from unregulated vehicle use.

HABITAT MANAGEMENT STRATEGIES

The major habitat initiative in this EMU is an Interagency/Private Conservation project entitled Maintenance of Elk Habitat - Recovery of Public Hunting Opportunity in the Granite Butte Elk Management Unit. Participants in this cooperative venture include DFWP, USFS, BLM, Rocky Mountain Elk Foundation, Phelps Dodge Mining Inc.. A Geographic Information System (GIS) for this EMU is being developed for this effort, and will be used to determine the cumulative effects of various land use activities upon elk numbers, distribution and movements. The technology to visually display cumulative habitat impacts and the interrelationships between various land uses will enhance the ability of federal and state land management agencies to formulate cooperative management actions to address wildlife habitat problems.

This project will serve as a prototype for GIS applications to other typical elk hunting areas within Montana. Management emphasis will be on habitat recovery rather than mitigation of habitat loss through restriction of hunting seasons, as has been the trend in the past.

Elk security will be improved by cooperating with land management agencies to:

- reduce road density
- maintain or enhance vegetation structure that serves as important hiding cover for elk
- schedule human activities to avoid disturbance to elk during winter and spring

DRAFT POPULATION OBJECTIVES

- 1) Maintain a late-winter population of 1,600 to 2,000 elk.
- 2) Maintain an observed late winter bull:cow ratio of between 5-10, depending upon the hunting district per 100.
- 3) Maintain a minimum late winter calf:cow ratio of 35-45:100.
- 4) Provide for an annual harvest of 250-300 antlered and 120-200 antlerless elk.
- 5) Maintain an annual bull harvest comprised of 40% BTBs and 5-10% 6-point bulls.
- 6) Provide 21,000 hunter recreation days for a total of 4,000 hunters, annually.

POPULATION MANAGEMENT STRATEGIES

Improvements in bull:cow ratios and percentages of BTBs in the population will be addressed through habitat strategies (listed above) and road management strategies. Since elk security produces older age classes of bull elk, habitat management actions and road management offer the most promise for producing long-term benefits for elk populations and hunter opportunity. Antlerless harvest will be regulated with antlerless permits and/or A-7 licenses.

Annual winter helicopter surveys will be conducted to monitor population composition. Regular monitoring of radio-marked elk will also provide population and habitat use information. More restrictive bull hunting regulations will be proposed if improved elk security does not result in observed post-season bull:cow ratios of 10:100 (depending upon the hunting district) during 3 consecutive years, or if the harvest is comprised of less than 35% BTBs or less than 5% 6 point bulls during 3 consecutive years.

More restrictive regulations for bull hunting will be proposed if improved habitat security does not result in post season bull:cow ratios of at least 5-10:100 (depending on the HD) during 3 consecutive years, or if the harvest is comprised of less than 35% BTBs or less than 5% 6-point bulls during 3 consecutive years.

Numbers of antlerless permits or A-7 licenses will be adjusted in

relation to changes in the population trend. If calf:cow ratios drop below 30:100 for 3 consecutive years, monitoring information may indicate the cause. Corrective action might include improvement in elk security through road management programs, modifications in proposed land use activities, reductions in the number of antlerless permits or A-7s, or implementation of a spikes only season.

A 20% deviation from harvest objectives during three consecutive seasons will prompt re-evaluation of management objectives and may result in proposed changes in hunting season format.

REGULATIONS

A 5 week elk hunting season will be conducted in hunting districts 293 and 439. A 5 week limited archery season will be offered in HD 284. A 7 week season currently occurs in hunting district 443 in conjunction with use of the A-7 licenses. Antlerless harvest will be regulated with antlerless permits and/or A-7 licenses. The objective of these hunting regulations is to provide maximum hunter opportunity while maintaining elk population numbers and production.

Elk redistribution appears to be occurring as a result of the 7 week hunting season in hunting district 443. If resulting seasonal elk concentrations pose difficulties for habitat maintenance or private land owners, this season may be modified. A 5 week limited archery hunt will be conducted in HD 284 is to prevent elk use from conflicting with the livestock grazing district.

Alternative season formats designed to increase the ratio of bulls to cows could include:

- Permit-Only Season: this strategy totally controls the harvest and hunter numbers but severely restricts hunter opportunity
- BTB Season: this strategy focuses hunting pressure on the segment of the population that needs to be expanded (the older bulls), preventing bulls from reaching full maturity - but it will protect yearlings until they are 2 years old. Hunter success is reduced.
- Spikes Legal/BTB-by-Permit Season: this strategy produces older age bulls, and maintains hunter opportunity for spikes but it may be more restrictive than necessary if the real problem of declining elk security can be alleviated by modifying land use management.

If objectives for population numbers or productivity are not attained, the following regulations could be implemented:

- numbers of antlerless permits or A-7 licenses can be changed
- season lengths for antlered permits and A-7 licenses could be changed
- antlerless permits and A-7 licenses could be restricted to limited areas in order to focus harvest where needed

DRAFT GAME DAMAGE OBJECTIVE

Minimize or prevent game damage where ever possible and manage elk populations in balance with winter habitat availability.

GAME DAMAGE STRATEGIES

Pre-hunting season elk depredation upon alfalfa/barley crops occurs in hunting districts 439 and 284 by non-migratory animals; some post-season complaints have been received in hunting districts 293 and 443. Approximately 25% of the elk population in this EMU is migratory to the extent that these animals summer west of the continental divide and winter east of the divide.

Breaking a habit before it becomes tradition is the most effective way to prevent recurring problems. Resolution of summer depredation requires focusing attention on the offending individual elk, rather than through more liberal seasons which may not eliminate the specific offenders. The alfalfa/barley depredation will be handled with aversive conditioning tactics, kill permits or special early damage hunts. Winter depredations will be handled using fencing, stack paneling and late season damage hunts. In the case of winter conflicts on traditional winter range, landowner tolerances will be assessed, and the condition of public winter ranges assessed, so populations may be managed in balance with winter habitat availability.

DRAFT ACCESS OBJECTIVES

Work with private and public land managers to maintain hunting access at current levels given that elk security is not reduced.

ACCESS STRATEGIES

Programs to aid private landowners in controlling vehicle use on their lands will continue, and new road management programs will be implemented. There is currently ample access to public lands but the combination of existing road densities and vegetation manipulation on public lands is jeopardizing elk security. Elk security will be the focus of cooperative interagency efforts to manage roads and provide vegetative cover adequate to serve as hiding cover for elk.

c:\gb\granite.emu

APPENDIX 5. Roads Data Dictionary

Reply to: 2610

Date: 29 May 1991

To: Granite Butte GIS Technical Committee
Re: Road Mapping Criteria

This document should help clarify the methods used to map and attribute roads for this project. We have made a couple of changes in the process. First, we failed to include dates for area closures, these are now included in a table following the route closure dates. These will only apply for FS and some BLM lands at present, and should not affect what has been done for the initial quads. We have been numbering private and nonsystem agency roads differently than what we had set up. Please pay attention to the conventions outlined below and follow them. **It is critically important that we maintain consistency in our data collection efforts!** There are too many people handling these maps to allow us to get sloppy, and the people digitizing have more important jobs to do than decipher what we really mean. So do everyone a favor and do it right the first time. I thank you, Kathie thanks you, and her staff thanks you.

Mapping

Denise will provide mylar overlays for mapping purposes. Use only the overlays she supplies unless you coordinate directly with her (I don't think this will be a problem but you never know). The actual delineation of roads and trails should be done with a thin, red permanent marker such as a Pilot Pen. Use a solid line for roads and motorized trails, and a dashed line for nonmotorized trails. Mark the location of closures and breaks with a black pen, as using red for breaks could be confused for a spur or driveway. Keep things as neat as possible.

Identifier- will be an 8 character string consisting of a 1 char. identifier (whose land the road is on), 6 char. road number (if any), and a 1 char. jurisdictional code (who administers the road).

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	(followed by 16 char. road name, if any)
ID	Road Number						Jur.	Road	Maint	Type	Time		
							Type	Type			Closure		

Attributes tied to each road will indicate the type of road, maintenance level, and type and time of closure. These will be inserted in blocks 9-13 above.

The identifier and attributes will be followed by a 16 character road or trail name, if any. Leave blank if none.

Segmenting Roads Roads that cross jurisdictional boundaries should be broken into segments at the boundary, unless one agency administers the entire length of the road, such as a county road through FS and private land.

On the map itself, number all roads sequentially beginning at 1 and continuing on for the whole quad- do not start over at 1 when you begin a new district or jurisdiction. Put the actual road identifiers and attributes on a separate sheet to keep the maps neat. For roads that have been broken into segments, number the resulting segments on the map as parts of the same road, for example, as 53 and 53a to keep things straight. Spurs should be give their own unique identifier, and should be labeled as such on the data sheets, i.e., a spur off of a road labeled #12 would be 13, not 12a.

Keep track of roads that cross quad boundaries and their ID's. For now I think a photocopy of the quad and your attributes should be sufficient.

1. IDENTIFIER

A. Road number- Characters 1-7. Identifier followed by road number.

Identifier codes; 1st character.

B -BLM

H -Helena District, FS

L -Lincoln District, FS

S -State.

P -Private

C -County.

F -Other Federal (i.e., interstates)

Characters 2-7, use road number for state (if known), county (if known), and Federal roads. Number private roads sequentially, beginning at 0000001 on each quad. **Right justify all numbers.**

For roads within FS, BLM or State jurisdictional boundaries but w/out an agency number (nonsystem roads), assign it an identifier as a FS, BLM or State road and number sequentially, beginning at 0000001 for each agency (or district) for each quad. So, each district or agency should begin numbering its own nonsystem (unnumbered) roads at 000001, and continue private roads within their jurisdictional boundaries wherever the last person left off.

i.e., 1st private road, P000001 etc.

2nd private road, P000002 etc.

1st BLM nonsystem road, B000001 etc.

1st Lincoln nonsystem road, L0000001 etc.

2nd Lincoln nonsystem road, L0000002 etc.

This applies for each quad. The numbers are stored by quad, so duplication of numbers between quads will not be a problem. Unique numbers must be maintained on each individual quad only.

B. Jurisdiction- character 8

Use same codes as above for agency administering the road.

2. ATTRIBUTES- Characters 9-13

These indicate road type, maintenance level, type and time of closure.

A. Road/Trail Type -Character 9

1 -Surfaced Road

We had some problems defining "surfaced". The Forest Service's Transportation Information System (TIS) breaks surface type down into three basic classes: 1. aggregate (crushed gravel), 2. native materials, 3. primitive (generally 10 feet wide, two tracks, haul roads). BLM engineers break surface type out as "paved" or "dirt" roads. Dirt roads are further broken into three classes: 1. crushed gravel brought in, 2. natural surface, 3. primitive, includes two tracks, jeep trails, etc. Most FS roads are constructed of native materials, with some spot/fill work where necessary. For our purposes here, let's define surfaced as an improved roadbed of either native or imported material, generally at least twelve feet in width. Most FS system roads will be considered surfaced using this definition. Let's consider crushed gravel and natural surface roads as surfaced roads, and put primitive roads in the unsurfaced category.

2 -Unsurfaced Road

Basically, if it's not a surfaced road and is travelable by a vehicle greater than 50 inches wide, it would be considered an unsurfaced road. Roads listed by BLM or the Forest Service as primitive would fall into this category.

3 -Motorized Trail (ATV, snowmobile)

4 -Nonmotorized Trail (foot, horse)

B. Maintenance Type- Character 10

1 -Maintained

Receives some sort of maintenance on a regular basis that keeps it reasonably and prudently driveable with a conventional pickup.

2 -Unmaintained

Receives no regular maintenance, is maintained only on an "as needed" basis for timber sales, etc., or is not maintained at all.

C. Type of closure. 1 character.

- 0. None
- 1. Gate
- 2. Berm, kellyhump, tank trap, rocks, slash, pull culvert, etc.
- 3. Natural- Overgrown, rock slides, etc.
- 4. Sign only
- 5. (NOT USED AT THIS TIME)
- 6. Unkown
- 7. Closed but accessed by alternate route.
- A. Area Closure (Use Area Closure Dates)

D. Time of route closure by vehicle type, 2 characters.

If no closure, use "00".

Code	40"+	Vehicle Type Motorcycles	Snowmobiles
00	No Restrictions	No Restrictions	No Restrictions
01	Yearlong	Yearlong	Yearlong
02	Apr 15-June 1	Apr 15-June 1	No Restrictions
03	Oct 15-Nov 30	Oct 15-Nov 30	Oct 15-Nov 30
06	Yearlong	Yearlong	Oct.15-Nov 30
07	Oct 15-Jun 30	Oct 15-Jun 30	Oct 15-Nov 30
08	Sept 1-Jun30	Sept 1-Jun 30	Oct 15-Nov 30
09	Oct 15-Jun 30	Oct 15-Nov 30	Yearlong
10	Sept 1-Jun 30	No Restrictions	No Restrictions
11	Sept 1-May 31	Oct 15-May 15	Oct 15-Nov 30

E. Area Closure Dates, by vehicle type.

*To be used only with closure type "A", FS and BLM lands only.

Code	40"+	Motorcycles	Snowmobiles
01	Yearlong	Yearlong	Yearlong
02	Dec 1-May 15	Dec 1-May 15	Dec -May 15
05	Yearlong	Yearlong	Oct 15-Nov 30
08	Yearlong	Oct 15-Nov 30	Oct 15-Nov 30
09	Sept 1-April 30	Sept 1-April 30	Yearlong
10	Oct 15-Nov 30	Oct 15-Nov 30	Oct 15-Nov 30

3. Road Name- if any. 16 character max, leave blank if none.

I know this looks confusing, and there are going to be questions that are not addressed here. Try to coordinate with Denise or myself so that we can maintain consistency. Direct questions to either myself at 362-4265 or Denise Boggs at 444-4720. Enjoy.

Doug Grupenhoff
Biological Technician

Appendix 6. Elk data dictionary.

DATA DICTIONARY
GRANITE BUTTE ELK PROJECT

The elk data base exists in dBASE III Plus format.

<u>COLUMN</u>	<u>CODE</u>	<u>DESCRIPTION</u>
1-5	10121	IDENTIFICATION: The six digit elk radio ID numbers have been modified to save space in the program, and to accommodate radio frequency changes. Granite Butte elk transmitters are on the 150.000 - 151.999 band. The second digit of each transmitter is always a "5", so it was eliminated. Eg. Frequency 150.121 = ID # 10121 in the data base. If this transmitter is retrieved, refurbished and used again its ID # will be 20121. Elk observed, but no transmitter present, are given an ID # according to hunting district: 443, 293, 439, 435. See Appendix for list of radio ID numbers.
6-11	010291	DATE: Month Day Year
12-15	1800	TIME: The time the animal was located; recorded in military time. Eg. 6:00 pm = 1800.
16-17	12	ZONE: Universal Transverse Mercator (UTM) zone. The Granite Butte EMU falls within zone 12.
18-23	396100	ULONG: UTM for longitude.
24-30	5189200	ULAT: UTM for latitude.
31-35	04700	ELEVATION: Elevation of elk location. Eg. 4700 feet.
36	2	SEEN: States whether the radio collared animal was seen or not. 1=not seen, 2=seen,

3=track, 4=heard but not located

37-38

?

CLASSIFICATION CODE: Develop a concatenated key with column 37 = sex of animal and column 38 = herd unit #, or some other item such as winter range. This code currently not in use.

39-46

50011807

DRAINAGE CODES: Enables querying according to drainage to identify elk use of a specific area. The first (1st) digit represents the first order drainage - in this case 5 = Missouri River; the 2nd, 3rd, and 4th digits represent the second order - in this case 001 = Little Prickly Pear Creek; the 5th and 6th digits represent the third order - in this case 18 = Canyon Creek; and the 7th and 8th digits represent the fourth order - in this case 07 = Virginia Creek. See Appendix for list of drainage codes.

47-54

BASP

HABITAT: Type of habitat in which the animal was seen or located. The first character signifies the Life Form, the second, third, and fourth characters signify the species of tree. TOT will be used as a misc. key for trees that are unidentifiable. Eg. B = Deciduous broadleaf trees dominate, ASP = Aspen. See Appendix for list of habitat codes.

ADDENDUM TO ELK DATA DICTIONARY - Elk Radio Frequencies

Elk Radio ID #'s for dBASE entry. (frequency often changes - ID's stay the same!)

HD 435

<u>Frequency</u>	<u>ID</u>
150.351	10351
150.625	10625
151.106	11106
151.878	11878
150.005	10005
150.107	10107
150.304	10304
150.137	10137
150.322	10322
150.363	10363
150.595	10595
150.925	10925
151.012	11012

HD 443

<u>Frequency</u>	<u>ID</u>
150.121	10121
150.161	10161
150.171	10171
150.192	10192
150.281	10281
150.440	10440
150.501	10501
150.901	10901
151.121	11121
151.351	11351
151.431	11431
151.441	11441
151.521	11521
151.531	11531
151.091	21091
150.361	10361

HD 439

<u>Frequency</u>	<u>ID</u>
150.293	10293
151.151	11151
151.161	11161
151.191	11191
151.221	11221
151.321	11321
151.061	11061
151.081	11081
151.240	11240
151.261	11261
151.051	11051
151.070	11070
151.091	11091
151.111	11111
151.312	11312
151.331	11331

Elk observed but not associated with radio marked elk are recorded by the following generic hunting districts:

00435
00443
00439
00293

eg. 10351 = 1 - first time radio used on this project
 = 0351 - last four digits of actual frequency

21091 = 2 - second time radio used on this project
 = 1091 - last four digits of actual frequency

ADDENDUM TO ELK DATA DICTIONARY - GRANITE BUTTE HABITAT CODES

<u>CODE</u>	<u>DESCRIPTION</u>
A	Aquatic species dominate
B	Deciduous broadleaf trees dominate
C	Conifers dominate
F	Forbs dominate
G	Graminoids dominate
H	Herbs (graminoid/forb mixture) dominate
M	Moss or lichens dominate
N	Non-vegetated soil
P	Agricultural cropland
R	Rock or scree
S	Shrubs dominate

<u>CODE</u>	<u>SPECIES INCLUDED</u>
ASP	Aspen
CW	Cottonwood
DF	Douglas-fir
L	Larch
LP	Lodgepole Pine
J	Juniper
PF	Limber Pine
PP	Ponderosa Pine
SAF	Spruce-Subalpine Fir
SAL	Subalpine Larch
TOT	Trees - other

Appendix 7. Hunter Opinion Survey.

RESULTS OF THE 1990 HUNTER OPINION SURVEY FOR GB EMU

1. Total Responses Returned:
189 (45.5%)
2. Successful Harvest:
114 (60.3%)
3. Unsuccessful Harvest:
72 (38.1%)
4. Didn't Hunt:
3 (1.6%)
5. Total Males Harvested:
31 animals
6. Total Females Harvested:
80 animals
7. Was the animal killed on public or private land?
n = 112 Public - 52 (46.4%) Private - 60 (53.6%)
8. How many years have you hunted in the Granite Butte EMU?
n = 189 10 yrs. - 16 (8.5%)
 > 10 yrs. - 52 (27.5%)
 < 10 yrs. - 121 (64%)
9. About how many days per year do you hunt elk in this area?
n = 189 10 days - 34 (18%)
 > 10 days - 73 (38.6%)
 < 10 days - 82 (43.4%)
Total Hunter Days: 10.7 days/hunter
10. How do you hunt elk in the Granite Butte EMU?
n = 180 Rifle - 146 (81.1%)
 Rifle/Bow - 34 (18.9%)
11. What are your observations of the elk population in the Granite Butte EMU during the last five years?
 - 11a. Total elk population:
n = 154 Increased - 48 (31.2%)
 Stable - 78 (50.6%)
 Decreased - 28 (18.2%)
 - 11b. Total number of bulls in population:
n = 151 Increased - 24 (15.9%)
 Stable - 78 (51.7%)
 Decreased - 49 (32.5%)
 - 11c. Total number of branch-antlered bulls in population:
n = 144 Increased - 22 (15.3%)
 Stable - 60 (41.7%)
 Decreased - 62 (43%)

12. What percentage of your time spent hunting elk in the Granite Butte EMU was by:

n = 183

- 7.3% Vehicle
- 8.6% Vehicle w/limited foot travel
- 64.5% Foot Travel
- 16.7% Horseback
- 2.5% Trail bike or ATV
- 0.4% Snowmobile

13. Did you hire a hunting guide or outfitter to hunt elk in the Granite Butte EMU?

n = 189 No - 189 (100%)

14. Are you satisfied with the current opportunity to "get away from" other hunters while hunting in the Granite Butte EMU?

n = 189 Yes - 128 (67.7%) No - 61 (32.3%)

15. Do you feel the amount of vehicle access in the Granite Butte EMU is:

n = 180

- Adequate - 122 (67.8%)
- Too Much - 41 (22.8%)
- Too Little - 17 (9.4%)

16. Listed below are possible reasons for selecting the Granite Butte EMU to hunt. For each item, check the box that best reflects its importance to you.

ITEM	N	VERY IMP	IMPORTANT	NOT IMP
Natural Setting	165	78 (47.3%)	72 (43.6%)	15 (9.1%)
For Meat	181	100 (55.2%)	67 (37%)	14 (7.7%)
Close to Home	177	79 (44.6%)	62 (35%)	36 (20.3%)
To Kill an Elk	177	83 (46.9%)	73 (41.2%)	21 (11.9%)
To Kill a Bull	166	20 (12%)	54 (32.5%)	92 (55.4%)
Kill Older, Lg Bull	162	12 (7.4%)	38 (23.5%)	112 (69.1%)
Test Hunting Skill	161	32 (19.9%)	72 (44.7%)	57 (35.4%)
Learn About Elk	169	62 (36.7%)	76 (45%)	31 (18.3%)
Free Permission	163	91 (55.8%)	39 (23.9%)	33 (20.2%)
Paid Fee to Hunt	100	9 (9%)	2 (2%)	89 (89%)

17. Rate the quality of your 1990 hunting experience in the Granite Butte area:

n = 180

- Poor - 23 (12.8%)
- OK - 80 (44.4%)
- Excellent - 77 (42.8%)

18. Are you satisfied with the current opportunity to see brow-tine bulls in the Granite Butte EMU?
n = 189 Yes - 99 (52.4%) No - 90 (47.6%)

RESULTS OF THE 1990 HUNTER OPINION SURVEY FOR HD 293

1. Total Responses Returned:
55 (27.5%)
2. Successful Harvest:
35 (63.6%)
3. Unsuccessful Harvest:
19 (34.5%)
4. Didn't Hunt:
1 (1.8%)
5. Total Males Harvested:
5 animals
6. Total Females Harvested:
29 animals
7. Was the animal killed on public or private land?
n = 35 Public - 26 (74.3%) Private - 9 (25.7%)
8. How many years have you hunted in the Granite Butte EMU?
n = 55 10 yrs. - 3 (5.5%)
 > 10 yrs. - 18 (32.7%)
 < 10 yrs. - 34 (61.8%)
9. About how many days per year do you hunt elk in this area?
n = 55 10 days - 11 (20%)
 > 10 days - 16 (29.1%)
 < 10 days - 28 (51%)
Total Hunter Days: 11.2 days/hunter
10. How do you hunt elk in the Granite Butte EMU?
n = 54 Rifle - 40 (74.1%)
 Rifle/Bow - 14 (25.9%)
11. What are your observations of the elk population in the Granite Butte EMU during the last five years?
 - 11a. Total elk population:
n = 46 Increased - 14 (30.4%)
 Stable - 25 (54.3%)
 Decreased - 7 (15.2%)
 - 11b. Total number of bulls in population:
n = 44 Increased - 4 (9.1%)
 Stable - 20 (45.5%)
 Decreased - 20 (45.5%)

11c. Total number of branch-antlered bulls in population:

n = 42 Increased - 4 (9.5%)
Stable - 16 (38.1%)
Decreased - 22 (52.4%)

12. What percentage of your time spent hunting elk in the Granite Butte EMU was by:

n = 54 4.7% Vehicle
6.3% Vehicle w/limited foot travel
70.9% Foot Travel
17.1% Horseback
0.8% Trail bike or ATV
0.2% Snowmobile

13. Did you hire a hunting guide or outfitter to hunt elk in the Granite Butte EMU?

n = 55 No - 55 (100%)

14. Are you satisfied with the current opportunity to "get away from" other hunters while hunting in the Granite Butte EMU?

n = 55 Yes - 35 (63.6%) No - 20 (36.4%)

15. Do you feel the amount of vehicle access in the Granite Butte EMU is:

n = 53 Adequate - 33 (62.3%)
Too Much - 13 (24.5%)
Too Little - 7 (13.2%)

16. Listed below are possible reasons for selecting the Granite Butte EMU to hunt. For each item, check the box that best reflects its importance to you.

ITEM	N	VERY IMP	IMPORTANT	NOT IMP
Natural Setting	48	25 (52.1%)	19 (39.6%)	4 (8.3%)
For Meat	54	28 (51.9%)	21 (38.9%)	5 (9.3%)
Close to Home	52	19 (36.5%)	19 (36.5%)	14 (26.9%)
To Kill an Elk	53	19 (35.8%)	26 (49.1%)	8 (15.1%)
To Kill a Bull	48	4 (8.3%)	21 (43.8%)	23 (47.9%)
Kill Older, Lg Bull	47	7 (14.9%)	13 (27.7%)	27 (57.4%)
Test Hunting Skill	47	12 (25.5%)	18 (38.3%)	17 (36.2%)
Learn About Elk	49	20 (40.8%)	24 (49%)	5 (10.2%)
Free Permission	44	18 (40.9%)	11 (25%)	15 (34.1%)
Paid Fee to Hunt	32	4 (12.5%)	1 (3.1%)	27 (84.4%)

17. Rate the quality of your 1990 hunting experience in the Granite Butte area:
- | | |
|--------|------------------------|
| | Poor - 6 (11.1%) |
| n = 54 | OK - 27 (50%) |
| | Excellent - 21 (38.9%) |
18. Are you satisfied with the current opportunity to see brow-tine bulls in the Granite Butte EMU?
- | | | |
|--------|------------------|-----------------|
| n = 55 | Yes - 23 (41.8%) | No - 32 (58.2%) |
|--------|------------------|-----------------|

RESULTS OF THE 1990 HUNTER OPINION SURVEY FOR HD 439

- Total Responses Returned:
39 (60%)
- Successful Harvest:
36 (92.3%)
- Unsuccessful Harvest:
3 (7.7%)
- Didn't Hunt:
0 (0%)
- Total Males Harvested:
22 animals
- Total Females Harvested:
13 animals
- Was the animal killed on public or private land?
n = 36 Public - 2 (5.6%) Private - 34 (94.4%)
- How many years have you hunted in the Granite Butte EMU?
n = 39 10 yrs. - 2 (5.1%)
 > 10 yrs. - 11 (28.2%)
 < 10 yrs. - 26 (66.7%)
- About how many days per year do you hunt elk in this area?
n = 39 10 days - 5 (12.8%)
 > 10 days - 17 (43.6%)
 < 10 days - 17 (43.6%)
Total Hunter Days: 11.4 days/hunter
- How do you hunt elk in the Granite Butte EMU?
n = 39 Rifle - 30 (76.9%)
 Rifle/Bow - 9 (23.1%)
- What are your observations of the elk population in the Granite Butte EMU during the last five years?

11a. Total elk population:

- Increased - 15 (46.9%)
Stable - 14 (43.8%)
Decreased - 3 (9.4%)
- n = 32
- 11b. Total number of bulls in population:
- Increased - 10 (32.3%)
Stable - 15 (48.4%)
Decreased - 6 (19.4%)
- n = 31
- 11c. Total number of branch-antlered bulls in population:
- Increased - 8 (26.7%)
Stable - 10 (33.3%)
Decreased - 12 (40%)
- n = 30
12. What percentage of your time spent hunting elk in the Granite Butte EMU was by:
- 8.6% Vehicle
15.0% Vehicle w/limited foot travel
55.2% Foot Travel
16.7% Horseback
4.5% Trail bike or ATV
0% Snowmobile
- n = 39
13. Did you hire a hunting guide or outfitter to hunt elk in the Granite Butte EMU?
- No - 39 (100%)
- n = 39
14. Are you satisfied with the current opportunity to "get away from" other hunters while hunting in the Granite Butte EMU?
- Yes - 30 (76.9%) No - 9 (23.1%)
- n = 39
15. Do you feel the amount of vehicle access in the Granite Butte EMU is:
- Adequate - 26 (68.4%)
Too Much - 8 (21%)
Too Little - 4 (10.6%)
- n = 38
16. Listed below are possible reasons for selecting the Granite Butte EMU to hunt. For each item, check the box that best reflects its importance to you.

ITEM	N	VERY IMP	IMPORTANT	NOT IMP
Natural Setting	39	21 (53.8%)	15 (38.5%)	3 (7.7%)
For Meat	39	20 (51.3%)	16 (41%)	3 (7.7%)
Close to Home	39	21 (53.8%)	12 (30.8%)	6 (15.4%)
To Kill an Elk	39	20 (51.3%)	14 (35.9%)	5 (12.8%)
To Kill a Bull	39	12 (30.8%)	13 (33.3%)	14 (35.9%)
Kill Older, Lg Bull	38	5 (13.2%)	10 (26.3%)	23 (60.5%)
Test Hunting Skill	37	5 (13.5%)	17 (45.9%)	15 (40.5%)

Learn About Elk	39	15 (38.5%)	15 (38.5%)	9 (23.1%)
Free Permission	38	28 (73.7%)	5 (13.2%)	5 (13.2%)
Paid Fee to Hunt	30	2 (6.7%)	0 (0%)	28 (93.3%)

17. Rate the quality of your 1990 hunting experience in the Granite Butte area:

n = 39	Poor - 3 (7.7%)
	OK - 10 (25.6%)
	Excellent - 26 (66.7%)

18. Are you satisfied with the current opportunity to see brow-tine bulls in the Granite Butte EMU?

n = 39	Yes - 19 (48.7%)	No - 20 (51.3%)
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RESULTS OF THE 1990 HUNTER OPINION SURVEY FOR HD 443

1. Total Responses Returned:
95 (63.3%)

2. Successful Harvest:
43 (45.3%)

3. Unsuccessful Harvest:
50 (52.6%)

4. Didn't Hunt:
2 (2.1%)

5. Total Males Harvested:
4 animals

6. Total Females Harvested:
38 animals

7. Was the animal killed on public or private land?
n = 41 Public - 24 (58.5%) Private - 17 (41.5%)

8. How many years have you hunted in the Granite Butte EMU?
n = 95 10 yrs. - 11 (11.6%)
 > 10 yrs. - 23 (24.2%)
 < 10 yrs. - 61 (64.2%)

9. About how many days per year do you hunt elk in this area?
n = 95 10 days - 18 (19%)
 > 10 days - 40 (42.1%)
 < 10 days - 37 (39%)
Total Hunter Days: 10.2 days/hunter

10. How do you hunt elk in the Granite Butte EMU?
n = 87 Rifle - 76 (87.4%)
 Rifle/Bow - 11 (12.6%)

11. What are your observations of the elk population in the Granite Butte EMU during the last five years?

11a. Total elk population:

n = 76 Increased - 19 (25%)
 Stable - 39 (51.3%)
 Decreased - 18 (23.7%)

11b. Total number of bulls in population:

n = 76 Increased - 10 (13.2%)
 Stable - 43 (56.6%)
 Decreased - 23 (30.1%)

11c. Total number of branch-antlered bulls in population:

n = 72 Increased - 10 (13.9%)
 Stable - 34 (47.2%)
 Decreased - 28 (38.9%)

12. What percentage of your time spent hunting elk in the Granite Butte EMU was by:

n = 90 8.2% Vehicle
 7.2% Vehicle w/limited foot travel
 64.9% Foot Travel
 16.4% Horseback
 2.6% Trail bike or ATV
 0.7% Snowmobile

13. Did you hire a hunting guide or outfitter to hunt elk in the Granite Butte EMU?

n = 95 No - 95 (100%)

14. Are you satisfied with the current opportunity to "get away from" other hunters while hunting in the Granite Butte EMU?

n = 95 Yes - 63 (66.3%) No - 32 (33.7%)

15. Do you feel the amount of vehicle access in the Granite Butte EMU is:

n = 89 Adequate - 63 (70.8%)
 Too Much - 20 (22.5%)
 Too Little - 6 (6.7%)

16. Listed below are possible reasons for selecting the Granite Butte EMU to hunt. For each item, check the box that best reflects its importance to you.

ITEM	N	VERY IMP	IMPORTANT	NOT IMP
Natural Setting	78	32 (41%)	38 (48.7%)	8 (10.3%)
For Meat	88	52 (59.1%)	30 (34.1%)	6 (6.9%)
Close to Home	86	39 (45.3%)	31 (36%)	16 (18.6%)
To Kill an Elk	85	44 (51.8%)	33 (38.8%)	8 (9.4%)
To Kill a Bull	79	4 (5%)	20 (25.3%)	55 (69.6%)
Kill Older, Lg Bull	77	0	15 (19.5%)	62 (80.5%)

Test Hunting Skill	77	15 (19.5%)	37 (48.1%)	25 (32.5%)
Learn About Elk	81	27 (33.3%)	37 (45.7%)	17 (21%)
Free Permission	81	45 (55.6%)	23 (28.4%)	13 (16%)
Paid Fee to Hunt	38	3 (7.9%)	1 (2.6%)	34 (89.5%)

17. Rate the quality of your 1990 hunting experience in the Granite Butte area:

n = 87	Poor - 14 (16.1%)
	OK - 43 (49.4%)
	Excellent - 30 (34.5%)

18. Are you satisfied with the current opportunity to see brow-tine bulls in the Granite Butte EMU?

n = 95	Yes - 57 (60%)	No - 38 (40%)
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Appendix 8 . Base theme status for 34 topographic quad maps covering the Granite Butte GIS Project Area.

0 = QA Completed 1 = QA Not Completed * = Previous QA

	LA	BO	TR	OS	SH	OW	BL
Wolf Creek	0	0	1	0	1	1	1
Rogers Pass	0	0	0	0	1	1	1
Cadotte Creek	0	0	0	0	1	1	1
Gravelly Mountain	0	0	1	1	1	1	1
Hauser Lake	0	0	1	1	1	1	1
Lake Helena	0	0	0	1	1	1	1
Upper Holter Lake	0	0	1	1	1	1	1
Beartooth Mountain	0	0	*	*	*	1	1
Helena	0	0	1	1	1	1	1
Black Mountain	0	0	1	1	1	1	1
MacDonald Pass	0	0	1	1	1	1	1
Elliston	0	0	1	1	1	1	1
Avon	0	0	1	1	1	1	1
Scratchgravel Hill	0	0	1	1	1	1	1
Austin	0	0	1	1	1	1	1
Greenhorn Mountain	0	0	1	1	1	1	1
Esmeralda Hill	0	0	0	0	0	0	0
Ophir Creek	0	0	1	1	1	1	1
Rattlesnake MTN	0	0	1	1	1	1	1
Silver City	0	0	1	0	1	1	1
Canyon Creek	0	0	1	1	1	1	1
Granite Butte	0	0	0	0	0	0	0
Nevada Mountain	0	0	1	1	1	1	1
Finn	0	0	1	1	1	1	1
Nevada Lake	0	0	0	0	0	1	1
Helmville	0	0	*	*	*	1	1
Sheep Creek	0	0	*	*	*	1	1
Mitchell Mountain	0	0	0	0	1	1	1
Wilborn	0	0	0	1	1	1	1
Stemple Pass	0	0	1	1	1	1	1
Swede Gulch	0	0	1	1	1	1	1
Lincoln	0	0	1	1	1	1	1
Moose Creek	0	0	1	1	1	1	1
Marcum Mountain	0	0	0	0	0	1	1

Maps to be Completed 0 0 22 22 27 32 32

Per Theme

LEGEND

LA = Land Lines	OS = Lakes
BO = Boundaries	SH = Streams
TR = Transportation	OW = Ownership
OS = Lakes	BL = BLM Ownership

Appendix 9

ELK CAPTURED & MARKED IN HUNTING DISTRICT 435

Frequency	Collar		Eartag		Age	Sex	Dias-terna (in.)	Capture Method	Drainage - Section	Date	Status of Animal
	Color	Sym-bol	Right	Left							
150.005	Yel w/blk	blk H	A12648	A11840	2.5	F*	109	dart	Colo. Gul.	2-2-88	Dead radio 1-12-91 elk alive 4-27-90
150.107	Yel w/blk	blk ↔	A12072	A12073	1.5	M	85	dart	Colo. Gul.	2-2-88	Shot 11-26-88
150.137	Yel w/blk	blk ▲	A12534	A12540	8-10 dead	F	---	dart	Lazyman	1-18-88	Found dead 5-28-88
150.304	Yel w/blk	blk ♥	A12069	A12068	3.5	F*	108	dart	Lazyman	2-2-88	Lost 8-3-90
150.348	Yel w/blk	whi ▽	A11899	A12530	3.5	F*	---	dart	Nelson Gul	1-18-88	Lost 12-7-90
150.322	Yel w/blk	blk >	A12070	A12071	3.5	F*	108	dart	Mt. Helena	2-2-88	Shot 12-5-88
150.363	Yel w/blk	blk _	A11898	A12539	10 +	F*	---	dart	Lazyman	1-18-88	Shot 11-20-88
150.595	Yel w/blk	blk +	A12532	A12527	2.5	F*	---	dart	Nelson Gul.	1-18-88	Dead radio 3-14-91 elk alive
150.625	Yel w/blk	blk 3	A11900	A12537	1.5	F*	---	dart	Lazyman	1-18-88	Dead radio 4-22-91 elk alive
150.925	Yellow	blk ---	A12074	A12075	3.5	F*	107	dart	Lazyman	2-2-88	Dead radio 2-18-88 elk alive 3-14-91
151.013	Yel w/blk	blk %	A11822	A11820	6	F*	108	dart	Mt. Helena	2-2-88	Found dead 9-15-90
151.106	Whi w/blk	blk >	A26331	A26332	10	F*	111	dart	Lazyman	4-5-88	
151.879	Yel w/blk	blk ★	A11818	A11819	5-6	F*	106	dart	Mt. Helena	2-2-88	

June 1991

* Pregnant

Right ear tag listed first

Color and type of collar, eg. pvc, yellow

APPENDIX 10. Blood Profile Data From Sixteen Elk Captured in Hunting District 443, January 1990.

Ear Tag #	Creatinine Phosphokinase	Serum Channic Oxgloctetic Transaminase	Alkaline Phosphate	GGT	Total Protein	Albumin	Calcium	Phosphorus	Blood Urea	Creatinine	Total Bilirubin
Normals for Large Animals	0-50	0-50	0-58		5.5-6.6	1.7-4.6	9.2-10.5	4.0-7.0	20-30	1.0-2.0	0-0.2
23671	68	71	94	29	6.2	4.4	9.1	4.8	12	3.5	0.2
23669	52	64	52	32	7.1	4.6	8.7	4.1	9	2.8	0.1
23673	34	47	80	27	5.7	4.5	10.4	6.9	6	3.2	0.5
26380	107	76	276	36	7.2	4.4	8.8	3.5	14	3.0	0
26383	69	57	65	22	7.0	4.1	9.2	4.6	6	2.9	0
26385	36	56	214	15	6.7	4.6	9.9	5.9	10	3.1	0.4
26377	48	51	71	25	6.4	4.5	9.9	5.5	14	2.7	0.2
26387	51	55	266	20	6.9	4.7	9.9	3.4	12	3.3	0.1
23661	46	49	225	25	6.1	4.1	10.0	5.7	7	2.9	0
23658	51	59	110	20	6.8	4.5	9.7	2.9	7	3.0	0.1
26387	27	63	48	17	5.8	4.2	8.9	5.3	7	2.8	0.5
23653	29	38	25	57	6.8	4.1	9.4	4.8	9	2.2	0
23664	21	49	38	10	7.6	4.3	8.9	2.8	11	2.6	0.1
26393	71	146	284	69	7.0	4.4	9.9	3.9	11	2.8	0.1
26390	67	38	86	16	6.2	4.2	8.9	3.3	14	2.6	0.1
A7403	62	63	82	46	6.9	4.5	10.1	2.6	14	3.1	0.1

